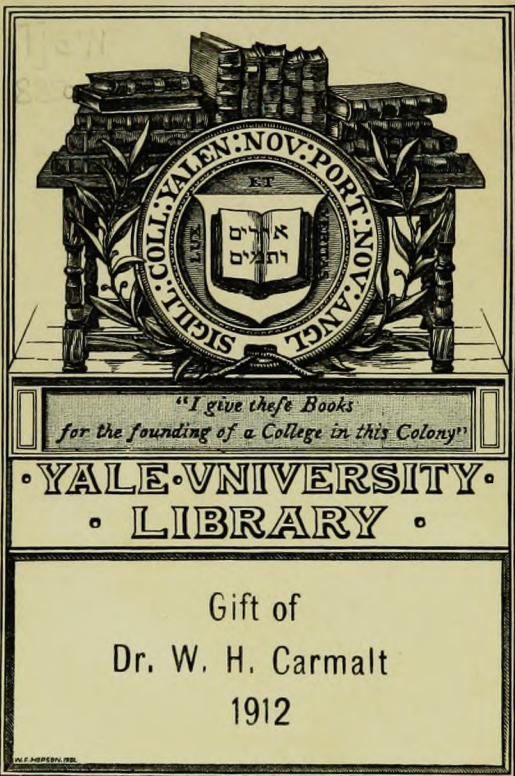


Surgical Diseases of Children

Edmund Owen, F.R.C.S.



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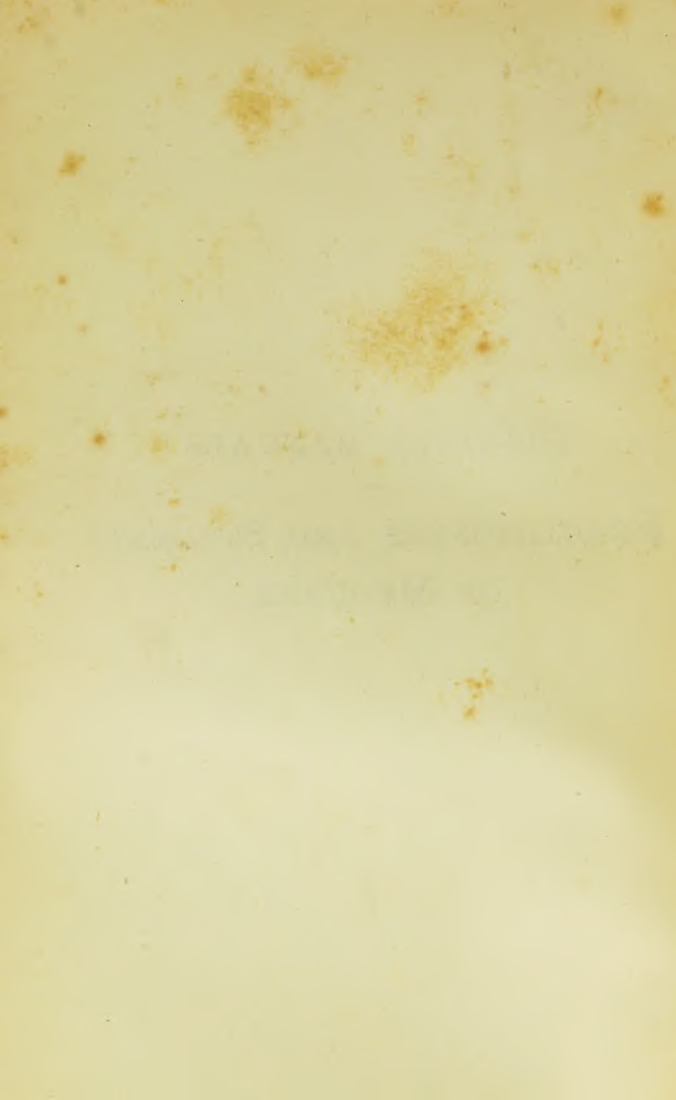






Fig 1



Fig 2.

THE SURGICAL DISEASES

OF

CHILDREN.

BY

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SURGEON TO, AND LECTURER ON ANATOMY AT, ST. MARY'S HOSPITAL;
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SURGEONS.

ILLUSTRATED WITH 4 CHROMO-LITHOGRAPHS
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THE SURGICAL DISEASES

CHILDREN.

1757

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To
MY FATHER,
WITH AFFECTION AND RESPECT,
I DEDICATE THIS BOOK.

PREP A C E.

It is hoped that, in the endeavour to compress within an allotted number of pages an account of the entire subject of the surgery of infancy and childhood, theory has not been unduly sacrificed to practice, nor clarity to condensation.

Claim is not made that this volume be considered an exhaustive treatise; its design is that of a "complete monograph" in a series of clinical manuals for practitioners and students.

Indebtedness is acknowledged to the work of many writers, amongst whom may specially be mentioned West, Cooper, Forster, Athol Johnson, Bryant, Holmes, Thomas Smith, Marsh, and Parlor. In the matter of development, reference has been made to Daltrey's "Human Physiology," and to the ninth edition of Quain's "Anatomy."

Thanks are tendered to Dr. Gee for permission to use sketches from the portfolio of the Hospital for Sick Children, for Figs. 16 and 17; to Mr. Thomas Smith for Fig. 22; to Dr. R. Lee for Fig. 4; and to Dr. Stevenson for Fig. 19; to Mr. Hutchinson for

Fig. 5, and to the present House Physician, Dr. John Thomas, for making the drawing from which the chrono-lithograph, Plate I., Fig. 1, was executed.

With many misgivings the author takes leave of his book and consals it to, as he trusts, indulgent criticism. In doing so he would express his thanks to the artists for the care which they have given to the illustrations, and to his friend and colleague, Mr. Bernard Pitts, for the supervision bestowed upon the pages as they issued from the press.

London, October, 1835.

CONTENTS.



CHAPTER	PAGE
I.—INTRODUCTORY REMARKS	1
II.—CRICK, DUMMELL, AND LARYNGITIS	18
III.—TRACHEITIS	22
IV.—CERTAIN DIARRHEAS	41
V.—SCURVY	48
VI.—RACHIC DEFORMITIES OF LOWER EXTREMITIES	57
VII.—ENLARGEMENT OF LYMPHATIC GLANDS	66
VIII.—TUMORS	112
IX.—NAVES	126
X.—HYDRO-THORAX AND EMPHYSEMA	136
XI.—HYDRO AND SCALDS	166
XII.—INFANTILE PARALYSIS—PSEUDO-HYPERTHYROIDISM— TETANUS—TETANY—PSEUDO PARALYSIS— NEURO-MIMESIS	181
XIII.—CERTAIN MALFORMATIONS OF HEAD AND NECK	263
XIV.—THE MOUTH, PHARYNX, AND EAR	275
XV.—HARD-LAY	281
XVI.—CLEFT PALATE	289
XVII.—FOREIGN BODY IN HIND-NECK—SCALDS OF FACE	324
XVIII.—SPICA RUTINA	329
XIX.—THE SPINE	334
XX.—THE OESOPHAGUS—THORACIC TRACT	337
XXI.—THE LUNGS	366

CHAPTER	PAGE
XXII.—HYDROCELE ORCHIDECTOMY	35
XXIII.—TINE TESTIS AND ITS COVERINGS	36
XXIV.—HEMIELA	38
XXV.—LATERAL CURVATURE OF THE SPINE	40
XXVI.—PERICRANIUM AND BONE	46
XXVII.—FRACTURES	47
XXVIII.—DISLOCATIONS	48
XXIX.—HIP JOINT DISEASE	49
XXX.—DISEASE OF THE SACRO-ILIAC JOINT	50
XXXI.—DISEASE OF THE SCAPULAR JOINT	51
XXXII.—DISEASE OF THE SHOULDER AND ELBOW JOINTS	55
XXXIII.—DISEASE OF THE ANKLE JOINT	60
XXXIV.—DYSPLASIA OF THE FOOT	61
XXXV.—DYSPLASIA OF THE FOOT	67
INDEX	200

THE SURGICAL DISEASES OF CHILDREN.

CHAPTER I.

INTRODUCTORY REMARKS.

Dr. West makes the observation, that though the infant cannot talk it has a language of its own, a language of signs; and that when little children are ill they will express their real feelings, whether by words or signs, to none but those whom they regard as friends.

To secure the confidence of little children much tact may be demanded. The surgeon should not go straight to the patient and begin asking questions bearing on the case. Generally it is advisable that he take no notice of him for some little time after entering the room, endeavouring rather to allay suspicions by talking in a quiet and kindly voice about the relations, toys, or other subjects of interest to the child. After communications have been opened up with the patient, and the utmost information obtainable by eye and ear has been secured, the actual examination may be begun. But attention should not, even then, be directed straightway to the affected part. Supposing, for instance, that the soundness of the right elbow be suspected, examination should begin with the left arm. As this causes no pain it excites no apprehension, and inspection of

the other elbow is readily permitted. It is advisable, moreover, to keep up a running fire of small talk with the child during the whole course of the examination, so that his attention may never have the opportunity of being directed to what is going on. At the same time the face should be regarded cautiously, yet with apparent indifference, for any slight, involuntary movement of the mouth may give evidence of the manipulation causing pain even though the child, from very timidity, would not confess to being hurt. If at the time of the visit the child be asleep, part of the examination or inspection may be carried out before he wakes.

The first part of the examination should consist in the careful comparison of the land-marks, and then, little by little, further information may be sought. The confidence of the child must not be overtaxed; and he must not be made to cry, as the case might then be spoiled for farther examination. But having once told the child that something must be examined, some little thing done, the same must be accomplished; he will soon find that firmness is not incompatible with kindness, and on the next occasion he will behave better. If it be a question of obscure pain or weakness in a limb or joint, it will be well to have the child stripped of his clothes, and to watch him leave or enter his bed; to see him walk (page 448), stoop (page 242), or run. This can be accomplished without needless exposure and chilling; but, as will be remarked later on, it is inexpedient to examine the child when he is but partially unclothed.

Anæsthetics.—No painful operation or wearying examination should be conducted without the aid of an anæsthetic; chloroform is best adapted for the purpose. At the Children's Hospital it is usually given on a piece of lint. If by chance the child become alarmingly feeble during the operation, he

should be held head downwards, so that the vascular supply of the brain may be restored.

Temperature.—Useful as the thermometer is in clinical work, too close an attention to its readings in the case of sick children may cause unnecessary alarm. The information obtained should always be taken in conjunction with other indications. Thus, a high temperature may be of little moment if the aspect of the child be serene, and there be neither irritability or lethargy; if the appetite continue good, the respiration, pulse, and secretions normal, and there be absence of rash, local inflammation, or sore throat. Parents are often caused much needless fear by being informed of the fluctuations of the temperature chart; and it is advisable, in many instances, that this record be kept as a confidential communication between the nurse and the surgeon.

The temperature may have no direct connection with pathological processes; its variations may be the result of a want of due organisation of the nervous system. Thus, some time since there were in neighbouring beds two boys who had been subjected in the same week to lithotomy. In one case the temperature suddenly ran up to 106° F. It was evident, however, that there was no cause for alarm; the child was lying calm and contented, and was interesting himself in some picture-book or toy which he was holding up for view. In a few hours the reading of the chart was again normal; convalescence was duly completed. It is the steady ascent of the temperature that forebodes ill, just as it is the gradual fall in the barometer that surely tells of the coming storm:

“Long foretold, long list;
Short notice, soon past.”

In the peevish or excitable child a trivial incident may send up the mercury several degrees; and time

after time has been found the administration of a dose of castor oil, the alteration of a splint, or the change of a dressing being the index again to the normal line. On one occasion the distribution of sponge-cakes through a ward by an injudicious friend produced a general elevation in the temperature of its occupants. This much is certain, that if after several trials with the thermometer the reading be found normal, there is no need for anxiety; in this way the instrument may prove of great value even in the hands of those who are but little skilled in the matter of diagnosis.

The **pulse** affords but slight trustworthy information of the physical condition; one requires to know the child and to know the pulse also before proceeding to draw inferences from what seems to be a departure from the normal. The pulsations, especially in the case of a nervous child, may vary by fifteen or twenty in the minute, from insignificant disturbing causes.

Towards the end of the examination the child should be asked to put out the **tongue**. If he refuse, and remain deaf to entreaty, a view may generally be obtained by compressing the cheeks between the finger and thumb; on the next occasion he will probably yield at the first request. It is interesting to notice the way in which the child spreads out the fingers when protruding the tongue to the utmost; the result of a strange association of muscular actions. If a child complain of feeling ill, or be suspected of being *sars* of sorts, it should be a matter of routine practice to inspect the throat (page 13), otherwise diphtheria or scarlet fever may occasionally advance without detection and without being suspected.

All **proposed operations** which are not urgently called for should be carried out only after careful consideration and preparation; and should there have recently been a case of scarlet fever in

the ward or in the house, it will be advisable to postpone operation until time and a thorough disinfection shall have diminished to the utmost the risk of infection.

The urine should be carefully examined for a day or two previously, especially for the presence of albumen. The throat and vagina should be inspected, and the morning's record of the temperature be specially noted. These precautions are necessary in order that the child may not be subjected to active surgical interference when, perchance, he is sickening for measles, scarlet fever, or other zymotic disease. In some instances it is necessary that a cutting operation be performed on a child whose urine is decidedly albuminous; as in the case of the child with amyloid disease of the liver and kidneys, secondary to chronic suppurative arthritis (page 127), or in the subject of interstitial nephritis from renal calculus. But one would decline to operate for cleft palate, hiatus of bladder, or any other condition not included under the head of "urgency," unless the working of every organ were deemed efficient.

When an operation is to be performed upon a child, the surgeon should insist upon the advisability of the parents not remaining in the room. Their presence is apt to be embarrassing, especially if anything go wrong either with the anæsthetic or with the operation. It is advisable, too, that, unless the understanding between the surgeon and parents be thorough, the former do not commit himself to an absolute expression of opinion, as to the nature of the fluid in a fluctuating tumour of a child, until that same fluid has been removed. Serum may be found where pus has been thought to exist, while the exploration of a suspected abscess may reveal sanguineous effusion, or, worse still, malignant disease. Lastly, when chloroform is to be administered for an operation, the anxious parent

should be provided that nothing shall be done until the little patient is thoroughly under its influence, and that any cries that may be heard will surely not be the expression of pain.

Scarlet fever is strongly apt to occur after any cutting operation, the germs being probably absorbed through the wound. Such inoculation may take place in spite of the use of spray and gauze, and its effects may be manifested within twenty-four hours of the operation. The rash is not to be erroneously called "erythema," or "surgical scarlatina," it is genuine scarlet fever;* it can convey infection even to an adult, and may be followed by desquamation and albuminuria. The child thus attacked should at once be isolated, but it does not follow that the result of the operation will be a failure. Sir James Paget has suggested† that children who have died with obscure symptoms a day or two after operation, may have succumbed to the influence of scarlet fever poison which had been hindered in some way from making its usual progress. Erysipelas occasionally follows on the so-called "surgical" scarlet fever. In the case of a boy with post-pharyngeal abscess, which was opened in the neck, scarlet fever set in, and subsequently facial erysipelas, from which, however, he ultimately recovered.

All medicines should be given in the most palatable form. Castor oil loses some of its efficiency by being shaken up in a bottle with a little warm milk and sugar. The smallest bulk is desirable as a dose; and, perhaps, it may be said that the less medicine given to children the better. One must not lose sight of the fact, however, that opium is a very valuable drug in the surgery of childhood. Some children can take it with great freedom and advantage, but it is well to

* *Hare's Lectures*, *British Medical Journal*, March 6, 1882.

† *Clinical Lectures*, page 222. 2nd edition.

begin with small doses, and to go on increasing them until the desired effect is produced. The simple tincture or cataplasmed tincture is the best form for administration. The first doses should be given every half-hour, or every hour, until ease of pain, drovaines, or commencing contraction of pupil gives evidence of the effect being produced.

If a child refuse to take medicine it may be administered by a small syringe, the nozzle of which is placed beyond the back of the tongue. The syringe should not be of glass if there be any risk of its being broken by the sudden closure of the jaws.

Leeches should not be entrusted to the care of an unskilled nurse. It may prove a difficult matter to stop the bleeding from the bite, amputation or suture being at times required. Children bear the loss of blood badly; nevertheless, it is extraordinary to see with what speed they may recover strength after a prolonged and exhausting operation, as for cleft palate.

Poultices are inconvenient; the warmth and moisture which they afford may be better supplied by a fold of lint wrung out in warm water, and applied under indiarubber tissue to prevent evaporation. The waterproof may be secured by a bandage.

We would speak highly of the value of sunshine in the treatment of sick children. If a child be not making satisfactory progress in one part of the ward, it is well to put him into a bed where the sun shines during a good part of the day. Even early after a serious operation, it is advisable to get the little patient carried out on to a balcony, into a garden, or to an open window, and there laid in the sunshine, due precaution being taken against cold.

A short series of instructions which the author has compiled for the guidance of mothers of out-patients is here appended.

HOW TO BRING UP INFANTS.

What food to give.—Mother's milk is the proper food for babies, and they should have nothing else. But if that cannot be got, or prove insufficient, fresh cow's milk is the next best food. The bottle should be filled with a mixture of cow's milk and warm water, in which a lump of white sugar and a very small pinch of salt have been dissolved. For the first few months there should be more water than milk; perhaps, twice as much water as milk; and as the babe thrives the proportion of milk may be gradually increased. No other food should be given before the sixth month; baked flour, arrowroot, and oatmeal cannot be digested; they may cause sickness and diarrhoea.

When to give it.—For the first month a baby should be fed every two hours, and, by gradually increasing the interval, he is in time fed every three, and, eventually, every four hours. He should not be fed because he cries; very likely he is in pain because his stomach is over-loaded. When he is sick, he should be fed for a less time and at shorter intervals, and if the bottle is being used, a larger proportion of water must be tried. If a fair sleeper, he should be woken up for his regular meals. A table-spoonful of lime-water may be added to each bottleful of food, especially in summer.

How to give it.—The best kind of feeding-bottle is the old-fashioned, long, straight one with a short indiarubber teat and with no tube at all. The worst kind is that with the long indiarubbery tube. There should be two bottles, one for day and one for night; after being used the bottle should be washed in hot water, in which a little soda has been dissolved, and should then be rinsed in cold water. Till next wanted it should be kept in a basin of clean, cold water. When six months old, the baby may be allowed, in addition

to milk, boiled bread and milk, oatmeal, baker's cracker, or Chapman's wheat flour. When about nine months old the mother should begin to wean him, by giving him less of the breast or bottle and some of the foods just mentioned, or beef-tea or mutton-broth and baked bread. At a year old the child should be entirely weaned, and soon he must have daily a little under-cooked meat pressed up into a pulp, with gravy and salt; some potato finely mashed and covered with gravy, an egg, or a little milk pudding. On no account should he be allowed wine, beer, tea, or coffee, though he may have cocoa and milk. He should be given his meals regularly, and should not pick at bread and butter, cakes, and sweet-stuff in the intervals. Children flourish best on fresh foods. The worst nourished patients are generally those reared on Swiss milk and various patent foods.

Clothing.—Babies and young children must be kept always warm; they cannot be hardened by scanty clothing or cold baths. Neck, thighs, legs, and arms need to be covered as well as the chest and body.

Fresh air.—Children should be taken out of doors daily when the weather is fine. If they be sent out in a perambulator, the feet and legs should be warm to start with, and well covered throughout the ride. Unless a bitter wind blow, or it be foggy, the windows should be opened for a while, fresh air being necessary. At night, if a child perspire freely, or kick off the bed-clothes, he should wear a flannel bed-gown long enough to be tied below his feet, and the bed-clothes should be securely tucked in. He should not be rocked or putted to encourage sleep, which should come naturally, and, like food, at regular intervals.

Bathing.—Morning and night he should be washed all over in warm water, but should not be exposed long enough to feel chilly afterwards. A handful of

sea salt thoroughly dissolved may be added to the bath. Except in the very warmest weather, a young child should not be put into a cold bath.

CHAPTER II.

CROUP, DIPHTHERIA, AND LARYNGITIS.

Croup, diphtheria, and membranous laryngitis are probably the same disease, produced by the absorption of poisonous germs. This theory forms a good working hypothesis, and its acceptance excuses the adoption of strict measures for the isolation of croupy patients. The chief argument against it is that croup is not so contagious a disease as diphtheria; but this is, after all, only a matter of degree.

In an outbreak of diphtheria the earlier deaths "may be referred to croup, the later to diphtheria." * The subjects of croup were those in which the exudation was confined to the larynx or trachea. "Diphtheria appeared to be developed from what was originally a simple sore throat, and the infectious character was gradually increased; it was possible that diphtheria had a pedigree. Might not membranous croup occupy a position in the development of the disease intermediate between sore throat and diphtheria?"

On the same page is quoted a case which occurred in my own practice. Tracheotomy had been performed on a child for, as it was thought, ordinary acute laryngitis, and next day the child was playing happily with its toys. In four days she was quite well again. We felt satisfied that the case was not one of diphtheria.

* Thomas Thomas, quoted by Mollison in "The Evolution of Medical Germs" 1883.

But in a few days the father, who was much with the child, contracted diphtheria; tracheotomy was performed, but he died, notwithstanding.

Diphtheria and scarlet fever may be "interchangeable," and occur side by side in an epidemic.* Indeed, the suggestion has been made that diphtheritic sore throat is scarlet fever without the rash.

The committee of the Medical and Chirurgical Society appointed to investigate the relations between membranous croup and diphtheria, remarked that it is still undecided whether diphtheria is as distinct a disease as scarlet fever or small-pox, and whether its poison is not readily generated under conditions of foul air and decomposing sewage. Also that there is strong evidence that it may be originated *de novo*, and produce cases which are contagious, and give rise to epidemics; that the sporadic cases of membranous laryngitis which occur apart from the possibility of contagion are diphtheritic; also that "whenever croup and diphtheria are prevalent, and cause great mortality among children, the cases of simple angina are greatly increased in number."†

Dr. Chaffey has supplied short notes of suggestive cases treated at the Pendlebury Hospital. 1. A girl, of two years and three-quarters, was admitted for measles, the rash being out; laryngitis supervened; after tracheotomy the child died. 2. A second case of measles was similarly complicated with diphtheritic laryngitis. Tracheotomy was performed, but without success. 3. A boy, of nine years, was admitted for diphtheria of fauces; a patch appeared upon the glans penis, the inguinal glands became swollen and tender; the child recovered. Four months later a case of

* Dr. PARSONS, *Quoted Soc. M.*, p. 27. Also *Brit. Med. Journal*, 12th April, 1884.

† *Transactions*, vol. 18th, p. 4. Also "Clinical Lectures," by Blandin, 1878, Sec. 1, 127.

laryngeal diphtheria was admitted from the same source.

Jacobi remarks* that cases of diphtheria can often be traced to exhalations from sewers, or even to filthy habits of life; so also can typhoid and dysentery. He asks, "Can, then, foul exhalations produce alike diphtheria, typhoid, and dysentery? Do these diseases arise from a common poison, or is the poison of a treble character?"

In the case of diphtheria spreading amongst families who are served with milk from one particular dairy, it by no means follows that the infective material has been introduced into the milk on account of imperfect surroundings; it is quite possible that one or more of the cows supplying it may be the subject of some obscure disease, which renders the milk capable of originating diphtheria in the human subject. Whether bacteria be the cause of the disease or merely its constant associates, is far from settled. No one has yet proved that the vegetable organisms alone, and not other free or fixed parts of the diphtheritic membrane, are the vehicles of the infecting elements. "Meanwhile, however, the parasitists have accomplished a victory; for the public mind and the judge's bench, even, are infected with bacteria faith." †

The term "Croup" was suggested by the peculiar sound which accompanies inspiration; its associations are with larynx and trachea. We should do better without the word; it nearly expresses a single symptom. "Diphtheria" is derived from *lephis*, leather, from the appearance of certain patches or skins of grey exsolation upon the soft palate or pharynx. These patches may be seen on depressing the tongue, or even on getting a child to open the mouth in a favourable

* "A Treatise on Diphtheria," p. 34. 1861.

† *Op. cit.*, p. 35.

light. But it is not always easy to view a child's throat, much less to apply remedies to suspicious patches on its mucous membrane.

Similar patches in the windpipe would not be visible, though they would be associated with dyspnoea, exhaustion, and other urgent signs. Croup is the disease when diagnosed by the ear; diphtheria, when diagnosed by the eye. The two forms of the disease often coexist; and every case of croup is not due to the presence of diphtheritic inflammation.

When asked to see a child who is feverish, without apparent cause, the surgeon should at once inspect the throat. Such a rule is excellent, as diphtheria is apt to come on very insidiously. There may be no prominent symptoms, though the lymphatic glands about the angle of the jaw may be found enlarged and painful, and the urine albuminous. Sometimes on looking at a "sore throat" one is shocked to find it covered with ominous patches. Although exhaustion is one of the chief associations of this false membrane, still children may be seen with one or both tonsils swollen and marked with grey patches, when there had been nothing to suggest the existence of serious disease. Such cases in the out-patient waiting-rooms may widely spread the disease. A mild diphtheria may quietly run its course without attracting attention, or even without recognition. It may be only when the inflammation spreads to the glottis that its urgent nature becomes manifest. A mild attack may clear off so happily that the correctness of the diagnosis of diphtheria may be questioned; a well-directed quarantine may be thus prematurely relaxed, and disaster follow. The patient with a mild attack, imperfectly isolated, may spread infection which produces the disease in its most virulent form. Too much care cannot be paid to the matter of isolation, and so long as a doubt exists as to the exact nature of a suspicious tonsillar or

pharyngeal inflammation, needless risks should be studiously avoided.

The **false membrane** is a tough and fibrous exudation in which pus corpuscles are incorporated as well as epithelial elements shed from the inflamed tissue beneath. The film may be so intimately connected with the mucous membrane that after it has been detached the exposed surface is found raw or ulcerated; during life a bright inflammatory border surrounds the patch. The internal loosening of the exudation-film is effected by the infiltration of macro-purulent fluid beneath. The exudation may extend down into the smallest bronchi. In certain cases it may be first formed in the trachea, whence it may spread into the larynx or pharynx, or down into the lungs. If discharge, stained with blood, trickle from the nose, a storm would widely scatter the disease germs. When the patch is found upon the tonsil, the inflammation may extend deeply through the mucous membrane, and involve the subjacent tissue in a species of moist gangrene. Thus extensive necrosations, foul and bleeding, may be formed. This condition shows the disease in its most virulent form, and prognostics ill. Fatal hæmorrhage may be determined by the sloughing. An opposite form of the disease is that in which, when the false membrane is detached, the mucous lining beneath it is found merely hyperæmic, and with no trace of ulceration. This is known as *superficial diphtheria*, and though the course taken by it may be short, and attended with but slight constitutional disturbance, it may prove highly contagious.

The Committee of the Medical and Surgical Society also reported* that there was evidence that membranous exudation in the air passages may be produced by mechanical and chemical irritants apart from contagious diphtheria; and that a few cases exist

* Transactions, vol. lxi., p. 2.

in which there is some evidence that membranous laryngitis has followed exposure to cold. And when, farther on, it is stated that "all the cases thus produced do not fall under the head of contagious diphtheria, and that there are classes of cases distinct from that disease," one is prepared for their conclusion that membranous croup and diphtheria are probably one and the same disease. Senator remarks that there is no sharp boundary line between the pseudo-membranous stage of diphtheria and the fibrinous exudation of croup; one passes gradually into the other. The sloughing corresponds to the more intense, the simple exudation to the milder action of the morbid cause; and that sloughs may involve the vocal cords, and that thence downwards the deposit may become of a more simple, membranous nature. He thus strongly advocates the identity of the disease, whether affecting the fauces or larynx. He holds that the affections of the larynx form a part of diphtheria, just as those of the pharynx and kidneys form a part of scarlet fever. And Lewis Smith remarks that, in an epidemic, croup is but the local manifestation of diphtheria, and that in New York physicians scarcely recognise any other form of membranous croup.*

Sometimes the virulence is so great that the child sinks of blood poisoning before membrane has had time to be produced, the throat appearing merely congested or inflamed. Bright red patches on different parts of the fauces are highly suggestive of diphtheria; they quickly become covered with the grey film. Other mucous tracts, such as the conjunctiva or the peridental lining, are rarely coated with the exudation. At first the disease may be an entirely local affection; sometimes its whole course is run without constitutional disturbance. Nothing is certainly known as regards its period of incubation. The diagnosis of such a case

* *American Journal of Medical Science*, May, 1855.

might for a time be obscure; but a high temperature, the possible existence of albuminuria, and the occurrence of like cases in the same house or neighbourhood, would be highly suggestive. The temperature may be but little elevated, although the disease is raging. The glands in the neck and at the angles of the jaw soon become enlarged and tender, and the connective tissues atrophy.

The appearance of albumen in the urine is an important feature of the disease. In an obscure case its presence may confirm the diagnosis. The albuminuria is associated with parenchymatous inflammation of the kidneys, with leucocytæ and growths of micrococci (Oertel).

The cause of the disease is not always to be determined, especially if there have been no cases of sore throat in the neighbourhood for some time. The drains or closets may be generally at fault; or in some direct or roundabout way a sewer may be ventilating itself into the house or the room in which the child lived or slept; or the drinking water may be poisoned by a neighbouring soil-pipe or cesspool. I know of three instances in which the disease seemed directly due to the inhalation of air laden with the odour of manure, which was being carted along the road or spread upon a field. Children are highly susceptible to such influences; even more than adults do they demand fresh air and pure water, their nervous sensitiveness being extremely acute. Probably the virulence of disease is brought about by the influence of germs; innocent, possibly, in their early development, they may become troubled from association with sewer-gas or drain-water, and entering the system may produce fermentative changes, which give rise to a severe sore throat, gastric catarrh, diarrhoea, or diphtheria. If the child be strong or the germs indifferent, the exposure may end in a passing attack of soreness of throat, whilst in other children

unequivocal diphtheria may occur. It is beyond question that diphtheria may give rise to membranous laryngitis without the occurrence of patches upon the pharynx. The associations of croup are slight cough and feverishness; then increasing trouble with respiration, the voice becoming hoarse. Later on the cough becomes loud, ringing, and "hoarse." When once heard it cannot be mistaken. The restlessness and fever increase; the voice grows weaker, and though the poor child's lips are seen to move, the words cannot be heard. He is extremely anxious, and if he fall into a daze he wakes up with spasmodic dyspnoea, grasps at his throat, or puts his fingers into his mouth, as if to clear away the cause of suffocation. When the spasm passes off, the face and body are covered with beads of sweat, and the night dress may be wet. Between the attacks the inspiration improves, but the air still enters with a noise which is not unlike that made by a saw working through a board.

As the dyspnoea increases the veins of the head and neck swell, the pale face becomes dusky, and the extremities grow cold. Then drowsiness steals in, and death may supervene from carbonic acid poisoning, pyæmia, or exhaustion; the child remains sensible till death is close at hand.

Generally the attack comes on towards night. The first symptoms may quickly supervene on exposure to wet or cold, or they may follow on what was thought to be an ordinary sore throat.

The **dyspnoea** is due partly to the muscles of the vocal cords being thrown out of working order, so that when an inspiration is taken they are driven into the rima by atmospheric pressure, but chiefly to the blocking of the glottis by false membrane. When expiration is prolonged and difficult, as well as inspiration, the presence of obstruction from exudation is evident; prolonged and noisy expiration is a bad

sign. The act of vomiting may cause a partial closing of the glottis, but the dyspnoea should be taken as an indication for tracheotomy rather than for the administration of an emetic, for when exhausted by the effort of vomiting, the child is in a less favourable condition for the inevitable operation. The prognosis is generally unfavourable, the disease being one of the most dangerous to which childhood is liable; the smaller the child the more easily does the glottis become obstructed. When it goes on to destroy life, not more than forty-eight or seventy hours elapse from the full development of the croupal symptoms to the fatal event. And, allowing thirty-six hours for the precatatory stage, the entire duration of the disease will be from four to six days (West). But sometimes the whole course of the disease is run in less than half this time. On the other hand, after tracheotomy, the child may rally for a time, sinking, perhaps, rapidly at last, on about the third or fourth day from the operation. Croup occurring at the end of an attack of diphtheria may run a wild course. Increased frequency of respiration is a bad sign, especially when it is accompanied with a rising thermometer. Parotitis is then to be feared. Cellulitis of the neck and enlargement of the glands about the angle of the jaw are unfavourable signs. So also are the complaints of pain about the ear. This may be the result of pressure of neck-swellings upon the auricularis magna, or some other nerve, or of an extension of the inflammation along the Eustachian tube. The fatal result is sometimes preceded by emphysema of the neck, resulting from rupture of the pulmonary vesicles and escape of air under the pleura, into the mediastinum, and into the connective tissue of the neck (Semater).

Concerning the temperature, something may occasionally be learnt as regards the probable termination

of the case, but one must not make too great a point of its observation. In certain cases one sees as much attention given to its registration as if it were a therapeutic measure. If, even in comparative health, a child's temperature may go up to 102° or 103° , it is little wonder if exacerbations in diphtheria be extreme; a persistently high temperature forebodes ill, so also does a rapidly falling one. Other unfavourable signs are an increasing amount of albuminuria, an unsteadiness or irregularity in the pulse, and sickness. Vomiting is a grave sign; it shows an irritable condition of the stomach, and its continuance must necessarily be attended with increasing exhaustion.

Although the **treatment of croup and diphtheria** will be further alluded to in the next chapter, it may be here remarked that any medicine administered must be with the view of keeping up the strength. Quinine and iron are the most useful drugs; but if the child can swallow only with the greatest difficulty, it is inadvisable that he should be haunted with medicines. So long, only, as he will take the dose with a little persuasion should it be given. Chlorate of potash, in small and repeated doses, is believed to be of value, as is also turpentine in doses of a drachm once or twice daily. The patches about the throat should be swabbed over with glycerine and perchloride of iron, glycerine and tannin, or some other antiseptic. But this local treatment, valuable as it may be, should not be persisted in if it causes distress or frightens the child. It is impossible thoroughly to disinfect the patches, and to worry a child until he is exhausted by repeating the local treatment is more likely to be attended by harm than good.

In the hours when diphtheria is a local disease, the application of a strong solution of corrosive sublimate or other germicide to the patches might effect much, but when the whole constitution is affected local treatment

can be but supplemental. The use of corrosive sublimate is not entirely free from objection. Though children bear mercury well, free absorption of the sublimate salt may cause griping, sickness, or diarrhea. The subcutaneous injection of minute doses of pilocarpine has, apparently, been adopted with success, the effect being "a copious flow of saliva, vomiting, and expulsion of false membrane, with profuse diaphoresis." The use of apocarpine beneath the skin, with the view of causing vomiting, when the child cannot readily swallow a draught, can be advisable in but few instances; its administration causes much depression. Sulphate of zinc is a more trustworthy emetic; so also is ipecacuanha.

Calomel has earned a considerable reputation in the treatment of diphtheria; in the pharyngeal disease one or two full doses may be given, but when the larynx is attacked, it excites a graver influence if given in repeated doses,* say, of a grain, every second hour, in combination with opium. In one desperate case in infancy, convalescence set in after "twenty grains of calomel" had been placed upon the tongue.

Hot compresses may be applied to the front of the neck; no other external application is likely to afford relief. The compresses may be sponges from which almost boiling water has just been squeezed by wringing them in a towel, and they should be constantly changed. This may do much towards relaxing spasm, but it should not involve delay in the performance of an inevitable tracheotomy. Discretion must always be exercised in the matter of leeches and emetics; a weakly child might be still further reduced by them. They exert no charmed influence. The patient must be closely watched; a high temperature demands free stimulation and constant counter-irritant; opium

* Levi Smith; *American Journal of Medical Science*, 31:7, 1865.

is better in high temperatures than iron. Benshaw advises that the membrane be removed as quickly as possible, as it prevents healing of the ulceration beneath, poisons the breath, and, becoming thicker, increases the risk of suffocation. He strongly urges that the discharges from the patient be received into vessels containing disinfectants, the clothes being also disinfected.*

The temperature of the room should be kept at about 65° to 70° Fahr., and the air should be maintained by a steam spray producer or a bronchitis kettle; vapour of sanitas or eucalyptus should be diffused with the steam, so as to diminish the foetid odour of the breath. The air must be kept fresh by judicious ventilation. Friends and relations must be kept out of the room; there is danger of the infection being spread by them; moreover, the sick child is disturbed by the sight of anxious faces. A sheet kept moistened with carbolic acid solution or ozonitis should be fixed at the doorway, and there should be no needless passing to and fro.

Even if the attack come on in the height of summer a large fire should be kept up day and night. Thus a thorough ventilation is maintained, and, the current of air setting in from the door to the fireplace, there is less chance of infectious particles being carried into the rest of the house. The most suitable room is one at the top of the house, where isolation can be more strictly carried out. The carpet and all superfluous furniture should be removed. Unfortunately, an ailing or sick child is often brought into the parent's bedroom before the nature of the disease has declared itself. The sooner, however, that he is taken to the top of the house the better.

As the difficulty of breathing increases, the question of **tracheotomy** (page 32) presents itself, and

* Froehner, January, 1883.

the sooner that the operation is resorted to the less will be the chance of inflammation of the lungs or exhaustion besetting its success. The following are the advantages of an early recourse to the operation: * The patient is better able to undergo it, the strength is preserved, more nourishment can be taken and more sleep secured; time is gained in which, it may be hoped, the disease will have run its course, and it is not unlikely that by the re-establishment of the free entrance of air into the lungs, pulmonary complications may be averted. I recently performed laryngotomy on a lady, who had caught diphtheria from her child. A few hours after the operation she made signs for paper and pencil, and wrote, "Such perfect bliss from suffering." Surely the prospect of this bliss should be offered to every patient who is suffering from the dyspnoea of laryngeal obstruction. Senator insists that it is not easy to perform tracheotomy too early, and that it is doubtful if the operation can ever be done too soon.

Tube.—Recently it has been again suggested, and actually demonstrated, that the introduction of a flexible catheter through the natural air passage may be the means of temporarily overcoming a spasmodic attack of dyspnoea; but this is not a trustworthy substitute for tracheotomy. The catheter would become quickly blocked with exudation, and it could not be cleared without constant removal. The trachea could not be entered with the management of such an arrangement. Lewis Smith remarks, that in experiments on animals the tube caused ulcerations. The antero-posterior diameter of the tube used by Dwyer is greater than the lateral; it is introduced by raising the epiglottis with the index finger, which is guarded and thrust to the back of the tongue. The presence of the tube in the glottis does not appear to

* Gay; *Philadelphia Medical News*, 1864.

cute distress. Probably there might be so much difficulty in the first introduction of the tube, that the child might be asphyxiated in the process. After due consideration, one feels justified in discountenancing its use in diphtheria in childhood.

It does not follow that because a child has pharyngeal diphtheria the larynx will be involved. But even if the inflammation do eventually spread to the glottis, the violence of the disease may have been so far expended that dyspnoea may not advance to an extreme degree. Sir William Jenner has observed, that "if the larynx be not invaded by the end of the first week of diphtheria, so as to require the windpipe to be opened, laryngeal obstruction rarely, if ever, occurs." *

The **convalescence** from diphtheria is full of anxiety. Frequently, when it seems well-established, the child begins to fail from an unwillingness to take food, or from an inability to retain or digest it. Sometimes a sudden attack of dyspnoea or rapid exhaustion may bring on a fatal result. As Senator remarks, the sudden collapse may be due to impulsion of the heart's action, through paralysis of some of the pneumogastric or other visceral nerves; or it may be due to fatty degeneration of the ventricular walls. The child may be happily amusing himself with his toys when, after a few convulsive gasps, all is at an end.

Vocalic paralysis may occasionally be associated with, or follow, an attack of diphtheria, after two, three, or four weeks. The power of accommodation is lost, letters and pictures being confused. The voice becomes "nasal;" food goes the wrong way, and the child grows thin. The soft palate is motionless. The absence of "knee-jerk" may be an early, persistent, and lingering symptom. The intercostal muscles, and even the diaphragm, may be affected, and death occur from asphyxia or pneumonia.

* Eschscholtz's "Surgey," vol. ii., p. 463. 4th edn.

The **treatment** may then comprise the internal administration of strychnia and belladonna, as a tonic to respiratory muscles, and, later on, the use of galvanism. The most important matter is to preserve the nutrition of the child if deglutition be interfered with; if he cannot swallow without food passing into the larynx he will at last abstain from all attempts at swallowing; then it will be necessary to feed him by a soft catheter introduced through the naris (page 43). Frictions with cod-liver oil, and the administration of nutrient enemata, may also be of service.

The pathology of the paralysis is obscure (such paralysis of the muscles about the glottis, which is associated with the inflammatory infiltration of the acute disease, is not here alluded to). The weakness of the muscles of the limbs, or the absolute paraplegia, may be secondary to some lesion in the anterior column of the grey crescent of the cord, and is thus allied to infantile paralysis (page 151). Abercrombie and others* have, indeed, observed degenerative changes in the cells of the anterior cornu of the crescent. Paralysis may come on with great suddenness, and after the most transient form of the disease. In one case a child was well advanced in convalescence after a mild attack of diphtheria, and in the morning was found hemiplegic, and unable to speak. Very gradually did the muscular power return. The prognosis is uncertain. When the branches of nerves which are associated with circulation, or which preside over respiration, are involved, the prognosis is more unfavourable than when only nerves of palate or extremities are implicated. Paralysis following an attack of diphtheria when the nature of a transient croup throat had escaped recognition, might appear inexplicable. An erratic selection of certain groups of muscles for paralysis, those of the soft palate and

* Kidd; *Medico-Chirurgical Transactions*, vol. lxx.

larynx to begin with, and then those of the orbit, trunk, or extremities, would afford unmistakable evidence of diphtheritic complication.

General advice.—If there be doubt as to the exact nature of a sore throat the child should be at once isolated, and, if possible, a trained nurse should take charge of the case; all other children should, if practicable, be sent out of the house. The mother must understand that resigning her child to the nurse is all to his advantage, and should be considered as a mark not only of common sense but also of affection. It is difficult, however, to get parents to take this view of the matter; and sometimes they will not be persuaded that the child is really suffering from diphtheria. If there be doubt as regards the nature of a suspicious inflammation, or patch, about the fauces, let the benefit of that doubt be accorded to hygiene. A few days' quarantine is a simple matter, and it may be the means of obviating great distress. In the case of diphtheritic hemiplegia mentioned above, the disease had been taken from the mother, who had so slight a soreness of the throat that she was not only not laid up, but pursued her work without interruption. Others of her children were also affected, some fatally. The exact nature of the disease may be decided with certainty only on the occurrence of albuminuria, exhaustion, or characteristic paralysis; or by the individual becoming the centre for fresh infections. Goodhart* says, in connection with the doubtfulness which may overhang the diagnosis of certain cases of sore throat, "It is much better to confess to some uncertainty than to make light of a complaint which, perhaps, is subsequently proved to be of scarlatinal or diphtheritic nature." Not only for the sake of the patient, and for that of other members of the

* "The Student's Guide to Diseases of Children," 1882.

household, but also for the reputation of the medical attendant, should this advice be attended to.

Those about the child should be careful not to inspire whilst leaning over to point the throat or to clean the tube. And when the patient coughs through the mouth or tube, there should be no thoughtless exposure to the column of expired air. Brothers and sisters who have been with the sick child must not mix with other children, lest, though they at present show no signs of disease, their breath, or saliva, be the means of spreading infection. It is through some direct source that the contagion is usually propagated, but particles coughed upon a coat or dress, drying there, and subsequently brushed off and inspired as dust, may give rise to infection. Such particles may hang about the furniture or walls of the sick room and cause subsequent infection. The greatest care should be taken about disinfection even though the disease may be rarely propagated except by direct contagion. Sponges and feathers should be burnt, and towels plunged in a pail containing a solution of caustolic acid or corrosive sublimate. The fumes of burning sulphur are the most valuable general disinfectant for rooms and clothing.

Those in attendance should be liberal in the use of disinfectants, and should, as a special precaution, wash out the mouth and gargle the throat from time to time with some mild astringent. And when the atmosphere of the room is abundantly laden with the germs of the disease, and traces from some cause or other is hanging about the person of the surgeon, he need not hesitate to set the example of clearing the throat, and to rid himself of a likely source of infection. To reduce to the utmost the chance of carrying about infection, all those whose duty calls into the sick room should have a knee dress, hanging at the entrance, with which he can cover his other

clothes. But it is usually impracticable to carry out this desirable precaution. At the Children's Hospital long caucoks are hung in the ante-room of the ward, one of which the surgeon should wear instead of his coat when he is about to pay his visit. Lastly, when death has released the child, the sooner the body is removed from the house the better. On no account should friends or relatives, who have hitherto been denied intercourse with the sick-room, be now admitted. The last offices should be quickly performed, and the body enclosed in the shroud, together with plenty of carbolic acid powder, chlorinated lime, or other disinfectant. The funeral should take place within forty-eight hours after death, and should not be an occasion of a gathering of friends or relations.

Convalescents from diphtheria should be regarded with suspicion, and kept apart from playmates and schoolfellows. Though the attack may have been slight, and its last manifestations definitely passed away, convalescents may carry about with them, probably on the pharyngeal or nasal lining, germs which may cause the disease in a far more serious form than that from which they have so happily recovered. As to what the length of the period of quarantine should be I will not attempt to predicate, but will not content with calling attention to an important element of danger. It has been suggestively remarked that there is as much diphtheria out of bed as in bed, and nearly as much out of doors as indoors.

Acute catarrhal laryngitis.—Croup, let it be repeated, is but a symptom of a disease, and it occurs in two forms of laryngitis: in the inflammation of diphtheria, and in the acute laryngitis which may come on after a child has been exposed to wet or cold. In the preceding paragraphs the two kinds of

laryngitis have been described together. The practitioner is no more able to dissociate them on paper than, in many cases, he can at the bedside. In diphtheritic laryngitis an exudation membrane is formed; in the acute catarrhal form it may not be. This latter disease is of frequent occurrence; it is not infectious. But who can venture to say that an attack of acute laryngitis is of the non-infectious variety? If a child happily recover from an attack of membranous (diphtheritic) laryngitis, its true nature may possibly escape recognition, unless it have occurred in association with other cases. Some cases of diphtheritic croup begin as an ordinary laryngitis, diphtheritic inflammation supervening. Without seeing patches upon the fauces, it may be impossible to affirm that a laryngitis is diphtheritic, though, if it occur in an epidemic, there can be little doubt as to its nature. In each case the voice is harsh and rasping, and steadily decreases in force; the child speaks with pain, and has evident difficulty in swallowing.

Treatment will correspond in most particulars with that advocated above. If one could say for certain that the laryngitis is not diphtheritic, strict isolation of the child would not be so urgently demanded; but this is often impossible. An apparently slow case of acute catarrhal laryngitis may show its nature by conveying infection, when convalescence has set in. The reason why "croup" is described as being less infectious than diphtheria, is because the virulent, diphtheritic variety of the disease is apt to be reckoned in the tables of statistics together with cases of acute catarrhal laryngitis. The latter disease comes on suddenly, and gives the good figures for tracheotomy. These are the cases, also, which occur after the floor-sweepings of the Saturday afternoon; but even in them there may be some exudation membrane in the larynx. It is a good plan to suspect malignancy in

every case of "croup." Time will, in all probability, make the diagnosis clear.

It would be very rash to affirm that an acute laryngitis is not diphtheria, even after the rapid establishment of convalescence. On the other hand, when in the throils of the child with the croup-symptom, grey patches are found; when the child rapidly sinks, even in spite of tracheotomy; or when the croup-symptom occurs in an epidemic of croup, diphtheria, or scarlet fever, the identity of the virulent disease is only too evident. In these cases exudation membrane would be found post-mortem at the larynx, though patches might not have been seen during life.

Chronic laryngitis, which is often the result of congenital syphilis, renders the voice rough and harsh, and impedes respiration; it may give rise also to an irritating cough. Expiration, as well as inspiration, is prolonged. The attacks of dyspnoea are liable to periodical and serious exacerbations; especially are they apt to come on at night, when the cough may have something of the peculiar metallic ring of croup. Niemeyer remarks* that it is thus that we hear so often of children who have suffered eight, ten, or even more attacks of "croupous" laryngitis. Croup is neither so frequent nor so innocent a disease, and there has probably been an error in diagnosis. Running from the nose may be taken as evidence that the laryngeal trouble is of the simple catarrhal nature, and is, therefore, a good omen. Niemeyer offers the caution against shutting up children in the house, even though they have suffered from laryngitis. They should be kept in the open air. In bad weather they should be warmly clad, but the neck should not be heated with a comforter; he advises that the throat should be washed in cold water. The child should not talk loud, nor sing, and he should be instructed to moderate his

* "Practical Medicine," vol. i., p. 8. 5th edit.

cough. A couple of lozenges placed over the trachea, counter-irritation, wet compresses, suction, steam inhalation, medicated vapours, very small doses of morphia often repeated, iron and quinine, are all useful in various phases of the disease. If the dyspnoea becomes extreme, tracheotomy will be demanded; the operation might also be performed for intractable laryngitis, so as to give the inflamed tissues about the glottis useful rest.

Laryngismus stridulus, or laryngeal asthma, is a spasmodic affection of certain muscles about the glottis preventing the ingress of air. It is particularly apt to occur in weakly male children, and between the ages of two months and two years, especially in the winter. Tho' later it appears the less amenable is it, as a rule, to treatment. Frequently it is associated with tetany. The distress comes on without warning, the child waking up in the night in great alarm. It often comes on with weaning, and seems to be directly caused by improper feeding. There is no fever, expectoration, or cough, the condition being probably the effect of some disturbance of the pneumogastric nerve or of its recurrent branch. The mucous membrane of the larynx being unaffected, the voice is not changed. Sometimes the attack is solitary, but it may be repeated at varying intervals; urine and feces may be voided during a paroxysm.

At last the carbonic acid intoxication caused by the spasm renders the reflex centres torpid: thereupon the contraction yields, and the breathing becomes calm again. In those instances in which the spasm is associated with convulsions the prospect is serious, and the case may end fatally. Probably this is not an infrequent cause of sudden death in weakly infants, who, it has been supposed, have been overfed.

Treatment.—The condition of the alimentary canal and of the gums should be inquired into, and

special care should be given to the matter of feeding. If the disease be indeed a nervous of the pæro-gastric, its dependence on indigestible food is intelligible. The child is most likely sickly; the diathesis, therefore, must receive special attention. It is said that hand-fed infants are more liable to it than those brought up at the breast (Niemeyer). Tonics are required, and occasional doses of rhubarb and soda; counter-irritation is of doubtful value, and the atmosphere of a hot room is depressing. Ringer advises that the infant be sponged over several times a day with cold water, for the sake of the tonic effect, and that he be taken out of doors daily, no matter how cold the air may be. If, however, a child be liable to leucæmia he should be kept indoors when the weather is very severe, being sponged with cold water nevertheless. To cut short a paroxysm cold water may be dashed over the face or over the body. Steffen also insists on the need of fresh air in the room, and of the child being out of doors as much as possible. The drugs employed are those directed against rickets and struma. If the infant be unconscious, convulsed, or cyanosed, he may be placed in a warm foot-bath, whilst cold affusions are used for his head and neck. After the bath he may be found to breathe better sitting. Waterhouse advises traction of the tongue during the attack to prevent closure of the glottis, or sprinkling cold water in the face. (Probably elevation of the chin, as advised by Howard, of New York, would serve better than the drawing forward of the tongue.) In the intervals he gives bromide of potassium, regarding it as almost a specific; it must be given in rather large doses: four grains morning and evening, gradually increased to eight grains. In one or two days the attacks will have ceased.*

* *Practitioner*, January, 1885.

Artificial respiration.—If, on the arrival, the child be found apparently dead, the medical man should at once set about the performance of artificial respiration by slow, alternating pressure of the hand, and relaxation, upon the chest walls. No case should be left without a trial of this measure.

CHAPTER III.

TRACHEOTOMY.

TRACHEOTOMY is likely to be one of the first operations the young practitioner is called upon to perform. It is often demanded after daylight, and when skilled assistance is out of reach. The operator may consider himself fortunate if he have a friend to administer chloroform and to lend a hand with sponge or hook, and a nurse to hold a candle. Even with the most competent surgeon, the operation does not always go smoothly; but one must meet difficulties with equanimity, and doggedly proceed to open the trachea and insert the tube. Even if the chloroformist exclaim, when the operation is but half way through, that the child is dead, the surgeon should not be disconcerted; the tube must be introduced.

Statistics are of no avail in the **appreciation** of the operation; each case is to be treated on its merits. If a child be writhing in the agony of dyspnoea, or lying exhausted under the physical exertion of fruitless attempts to inflate the lungs, the trachea must be opened. The unhappy parents are greatly to be pitied in these circumstances; suddenly overwhelmed with despair, they may be unable to consent to, and unwilling to foetus a procedure which, after all, holds forth a somewhat slender prospect of recovery. It is

then let the practitioner gently and persuasively to show that the child must not be allowed to die of sheer suffocation, and that the only chance of bringing him through even the immediate crisis is by admitting air into the wind-pipe below the obstruction. And who can tell but that this individual case may be one of those happy few which are rescued by operation? For even when the face is blue and clammy, the eyes turned up, and the child to all appearance in the jaws of death, the admission of air after tracheotomy (with artificial respiration if need be) may be the means of causing a return of colour to the cheeks, of restoring consciousness, and of stimulating the enfeebled heart to fresh endeavours. The child is never so near death from the exhaustion of dyspnoea that it is not worth while to operate. Tracheotomy will always give a chance, and it may be the means of rescuing the child, even when hope has been well-nigh extinguished.

When is the operation needed?—The answer is simple: "When an insufficient amount of air is entering the lungs." The signs of this are a sinking in of the suprasternal, xiphisternal, and epigastrie regions during inspiration, and a harsh or noisy passage of the air through the glottis. Further evidence of serious obstruction is prolonged and noisy expiration. If there be a doubt as to whether the operation may not be still farther delayed, it will generally be better to **perform it forthwith**. When more exhausted, the child will be less likely to benefit from the introduction of the tube. Many a case is lost from tracheotomy having been delayed. At any rate, the operation will not prejudice the child's chances.

Operation.—The low chest of drawers or table on which the child is to be placed, should be in the best light obtainable, against a window, or under the gas. If the operation be done after daylight it will be well to have a supply of lamps or candles placed

about. In a small room, with a single gas-jet from the middle of the ceiling, it will be advisable to have the neck of the patient almost under it, and to stick pieces of candle upon the mantelpiece, book-shelf, or elsewhere, by planting them upon a little of the melted tallow or composition. Excellent illumination may thus be secured. Long candles may be cut in two, and each half used. Unskilled assistants are of little or no use at a tracheotomy; they are apt to turn faint. The trunk and limbs being wrapped around with a thin blanket, the child should be placed with his shoulders lying on a small, firm pillow, and the head



FIG. 1.—Tracheal Wound Dilator.

thrown back, so as to draw up the trachea from behind the sternum. As Parker suggests,* a convenient pillow may be made by rolling an empty wine-bottle in a towel. An ordinary pillow beneath the head does harm by shortening the neck; the head does not want raising; the trachea is to be pulled up out of the chest. Krüken advises that the pillow be made by tightly stuffing a stocking with towels.

The **instruments and material required** are: Chloroform, sharp scalpel, two pairs of dissecting forceps, several pairs of pressure forceps, steel director, scissors, sharp hook, deep-seal dilator, various silver-plated tubes, a few ligatures, needle and suture, small sponges, feathers, and tape. These should be kept together so as to be obtainable at a moment's notice. Brandy, and a syringe for its subcutaneous injection, and vaseline, should also be in readiness.

* "Tracheotomy."

Anæsthetics.—Except in those rare and urgent cases where time does not permit of it, chloroform should always be administered. If the child be frightened, he may be "put to sleep" before being taken from the cot. The chloroform may be administered on a handkerchief, a few drops being sprinkled on it to begin with, only a small quantity will be required. Fagin Thornton is opposed* to the administration of chloroform, lest the child be not able to help clear the trachea by coughing up the mucus. Both for the sake of the child, however, and of the operator, I would urge the administration of the anæsthetic. There is always sufficient reflex irritability left for exciting cough, especially on the trachea being swept round with a feather passed down the tube. If the child be unconscious, or moribund, one operates forthwith; possibly the only instruments at hand being a penknife and a swan-quill. The surgeon stands at the child's right shoulder.

The **landmarks** are the thyroid and cricoid cartilages, the trachea, and the episternal notch. In a small fat-necked child it is not always easy to feel the trachea; it is very necessary to keep the head squared, and the incision in the median line. The deep part of the incision should be as long as the skin wound; a tapering, cervical wound leads to difficulties. The incision will be from one and a half to two inches long, and an important point is to keep it high up, beginning over the thyroid cartilage. If it be made farther down the neck, the trachea will be sought where it is deeply placed. Holmes advises that even the cricoid cartilage be divided. At any rate, the trachea is to be opened in the very highest rings, the cricoid cartilage being cut through if expedient. If the wound made in the trachea be found of inefficient length, it must be enlarged upwards, not downwards.

* "Tracheotomy."

One need not fear the isthmus, but, tearing through everything with two pairs of forceps, the wind-pipe is at last exposed to the extent of the width of the top of the left index finger, which is being used as a guide. The isthmus is perforce divided. The subcutaneous and deeper tissues should, so far as is possible, be torn through rather than cut, so that there may be less bleeding. For this, two pairs of dissecting forceps may be advantageously used. There must be no hurry

during the operation. Bleeding vessels being secured with the long-pressure forceps, and the trachea actually exposed before it is opened. If the trachea cannot be made clearly visible (as may happen if the wound be deep or there be much bleeding), at least it must feel bare to the tip of the finger. If attempt be made to open it while it is still covered with fat and or aponeurosis, dis-



Fig. 2.—Self-holding Forceps.

appointment and venous delay result. Swollen veins which are in the way may be caught with two pairs of pressure forceps, and then secured. A few pairs of these forceps are of great help; with them the wound can effectually be kept dry without perpetual sponging, and any irregular or large vessel can be quickly secured by them.

The thermocautery is not suited for the operation; it makes the wound so hot, and its edges so hard, that the finger cannot be used as a guide, and the resulting eschars may be cut off with serious hemorrhage. It will be well if an assistant can hold apart the edges of the wound with small hook-retractors, since bleeding

vessels, and sponge the wound; but more often than not the chloroformist is the only friend at hand. A clumsy assistant is an embarrassment; he gets his sponges in the way, and if entrusted with retraction, he is apt to drag the trachea out of position.

When the wind-pipe is exposed, a sharp hook is thrust into it, to fix it at about the level of the cricoid, and the point of the scalpel is then plunged in from below upwards. The edge of the blade is directed forwards, and as many rings divided as may seem necessary for the introduction of the tube. The surgeon should assure himself by the touch that the hook is firmly in the wind-pipe; of this there must be no doubt. It has been recommended that the hook be passed into the trachea at a little distance from the middle line, its point being made to come out again through the tracheal wound. It is better, however, in this, as in every step of the operation, to keep exactly in the median line.

As soon as the trachea is opened air bubbles up through the mucus and blood, and the anxiety of the operator begins to diminish. Forthwith the dilator is passed into the wound, and the blades separated; the child chokes, and coughs blood and mucus, the tube is introduced between the blades of the dilator; the spasmodic respiration quiets down, air passes through the tube; and breathing is so peaceful (such a change after the late noisy respiration) that a stranger to the process might think the stillness beokened death. Colour returns to the face. The pulse improves. Thick mucus is driven into the tube, and removed with feather or camel hair pencil. Strips of false membrane are extracted with forceps.

The **tube** which best answers the various requisites is of metal, and consists of an outer and an inner part. The outer part has two lateral limbs, one of which works on a hinge. This outer tube is introduced by

itself, the limbs being pressed together, so that the skin, flat and easily slips in between the blades of the dilator, even if the tracheal wound be small. A round-ended tube is apt to compress the trachea without entering it. The hinge allows the inner tube to pass between the limbs, without any force being needed. The tube should not be too large nor too much curved forward. With the latter fault, pressure might bear against the front of the trachea, with, possibly, fatal consequences. The tube need not completely



FIG. 2. — Method of Inserting Tracheostomy Tube.

fill the trachea. A useful size and shape is that shown in Fig. 2. It is large enough when it admits the air without noise. For small children, the lumen of the outer tube, at the level of the plate, may be of about the size of an ordinary steel pen holder, and, for larger

children, of the size of a cedar pencil. Every tube tapers gradually from the plate. If the neck be swollen from diphtheritic inflammation, it will be necessary to have a long tube. Unless the inner tube be longer than the outer, the end of the latter may become blocked. If required, a suture may be applied at the ends of the skin wound. One advantage of Palmer's rubber tubes is, that, long to begin with, they can be used in all kinds of necks. For a thin child, the end of the soft tube can be sliced off with a penknife.

Tying in.—When the breathing has settled down, the tapes are adjusted. There should be a tape for each side, and they should be long enough to be tied in a

double bow at the hinder part of the neck. The tape should be narrow enough to run easily through the slit in the tube plate, and being pointed, it may easily be passed from the surface of the plate, which rests upon the skin of the neck. A slit about half an inch long should have been cut in the middle line of the tape, near the end to be threaded, and the running end afterwards drawn through it, as shown in Fig. 3. But until the tapes are securely fastened, a finger should be kept on the plate of the tube to prevent its being forced out of place by a cough.

Clearing the wound of mucus and blood may be effected with small sponge. If the trachea itself be blocked, the mucus may be forced up to the surface wound by sudden and firm compressions of the chest walls, and it can then be caught and wiped away. Or a large ruffled feather may be pushed down the trachea, and, being twisted round, may entangle and draw out tenacious mucus, or cause it to be ejected through the wound by coughing. Shreds or tubular casts of false membrane may thus be taken up, and then caught at the wound by forceps.

In standing over a diphtheritic patient the surgeon runs great risk of infection, by the breath of the patient, or by the out-rush of air through the wound. This risk is run in the course of duty, and is scarcely heeded. But if, after the trachea is opened, the air do not pass through the wound freely enough to satisfy the surgeon, it is not his duty to put his lips to the wound and endeavour to suck the parts clear of obstruction. This proceeding is neither lawful nor expedient. Sucking can be of no peculiar advantage. It may cleanse the surface of the wound of blood and mucus, so that the rattling noise is diminished; but this could be done as effectually by a piece of sponge. It cannot clear the trachea, because suction can be effected only under the influence of atmospheric pressure, and the

lungs are a shut man. Were the trachea open below, the act might avail much. Air locked in the bronchial tubes can hardly be possessed of sufficient expansive force to help the expulsion of mucus or membrane, even when a powerful suction is at work at the wound. But the surgeon is apt to lose sight of these facts when he sees his little patient failing to gain the relief which the operation was expected to bring. The intense anxiety which at this juncture he feels for the patient, for those to whom the young life is dear, and, let it be added, for the success of the operation itself, is apt to impel him forthwith to put his mouth to the wound. I am fully convinced of the fatuity of the act. It is as unemphatic as it is dangerous, and has caused the unavailing sacrifice of many an heroic life.

It has been suggested that the trachea may be cleared by a catheter passed down the wound, and fitted with an exhaust bell. But even this scheme does not appear very practicable, and during a resort to it the tracheal wound remains blocked, and time is being lost. Reliance should be placed rather upon the effect of firm pressure over the chest to drive up fluid or shreds. By the help of a sponge the complete removal of the obstructing material may be better effected. But the introduction of a long primary feather may set the child coughing, or may more directly clear the trachea. By turning the feather round in the trachea, or even in a bougie, a more thorough effectual clearing of the wind-pipe can be obtained than by any other method.

Mr. Shelwell* has designed an apparatus, which has worked well in the mortuary in sucking sawdust material through a tracheal wound. It consists of a short glass tube, one end of which is shaped to fit the throat, whilst the other is connected with an india-rubber tube and an exhaust syringe; but it is not improbable that its actual employment would lead to

* *Lancet*, March 21, 1883.

disappointments. On no account should small pieces of sponge be introduced into the trachea, or even into the wound in the neck; they are apt to be carried adrift, and so to plug a bronchial tube. Artificial respiration should be resorted to on the conclusion of the operation if breathing be not established. It should be persevered in for half-an-hour, or even more. By this means life may be restored after all hope has been given up. Tracheotomy must be completed, though the child be apparently dead upon the table.

Fallacies in the operation.—The skin wound may be too low and too short; the trachea may have been dragged aside, or not sufficiently incised, so that the tube (especially if it be a round-ended one) does not enter, but slips down in front of it. The trachea may be altogether missed if the dissection be not kept in the absolute middle line. If the wound in the trachea be made with a dull scalpel, and without the little plunge, the mucous lining may escape transfixion, the tube passing down between it and the tracheal wall. If air do not pass through the tube, either naturally or on compressing the chest, the chances are that the tube has not been passed into the trachea. If air cannot be made to flow, the tube must be quickly taken out, the dilator introduced, and the trachea exposed and explored. The tube may be blocked with mucus, or its aperture obstructed by false membrane. If the tracheal wound be open, search should be made for a membranous cast of the trachea, which might be drawn out by forceps. For thorough exploration, the tracheal wound should be enlarged slightly upwards, and a pair of forceps introduced. The occasion is critical; but fortunately is rarely encountered. Much more likely is it that the tube has been passed down amongst the ribbon vessels at the front of the trachea than that its end is blocked by a membranous cast of the trachea.

Pagin Thornton has seen, at the post-mortem examination of a child, three cuts on the vertebral column, which had been made by a house-surgeon in fruitless attempts to open the trachea.* Probably the unhappy operator had lost his handiwork, and then his head. He should have paused in the middle of the operation, sponged out the wound, secured bleeding vessels, and calmly felt with the tip of his left index finger for the trachea. To attempt to insert it before it is bared beneath the finger and secured by the hook, is reckless surgery. Nothing is gained by dash in the operation; steadiness is everything. The surgeon who has operated upon a fat-necked infant would have more sympathy with him who snarled these vertebree than might he who had no experience in the operation.

Tracheotomes.—Various ingenious instruments have been invented with the idea of simplifying tracheotomy: by the thrust of a double-bladed instrument the trachea was straightway to be opened. But the blade is apt to coarsen, or to slip from off the movable trachea, or to go through both its walls, and into the œsophagus or vertebral column. The tracheotome is a dangerous instrument; there is no royal road to the operation. It is one thing to introduce a tracheotome into the wind-pipe of an adult subject in the tertiary, and another to succeed with it in that anxious moment when a child is at the point of death from asphyxia.

The **prognosis**, when the operation is performed for croup or dysphœria, is highly unfavourable, the cause of death being exhaustion, or the extension of the inflammatory process to the bronchi and lungs, or by blood-poisoning. Or death may be due to paralysis of important muscles of respiration, or of the heart itself. Occasionally the operator has a run of bad cases.

* *Op. cit.*, p. 32.

The **sick-room**, cleared of all unnecessary hangings and furniture, should be kept at about 70° F. A bronchitis bottle should be gently at work. The cot need not be brought too close up to the fire, nor should the column of steam be directed upon the child. One may sometimes find the hangings of the cot charged with moisture, and the condensed vapour falling in drops upon the bed clothes! The cot should be made into a little tent, so that the temperature can be better regulated, and the atmosphere kept moist. The moisture in the inspired air will, by increasing the exhalation, facilitate the separation of false membranes. The tent is arranged by fixing four long upright bars to the four posts of the cot, and connecting them above by horizontal bars, over which sheets are thrown.

The **after-treatment**.—The strength must be kept up with milk, egg-dip, wine, and quinine. But if the muscles of the glottis be affected with diphtheritic paralysis, or their action hindered, so that food enters the larynx, the child should no longer be fed by the mouth. If fluid food go the wrong way it may be found coming up through the tracheotomy tube, and mixed with frothy mucus. A very soft No. 8 metal catheter should be gently passed along the floor of the nares, through the pharynx, and into the stomach; through this the food can be administered by a glass syringe. The first drops of the fluid should be injected slowly, so that the surgeon may assure himself that the instrument has passed the right way. Nutrient enemata may also be used; one being given before the child is put in the cot; quinine may be given suspended in milk; and small pieces of ice may be put into the mouth to allay thirst. If it can be done without causing distress, the mouth and pharynx should be swabbed with glycerine of tannin. There may be done by the free use of a feather in the trachea,

the same should not be allowed to resort to the operation.

The **food** is to be given in small quantities, and at short intervals, say of an hour and a-half, or two hours. The stomach should not be overloaded, but vomiting supervenes; vomiting is a contingency to be dreaded; and the subject of diphtheria cannot be expected to have either good appetite or power of digestion. Wine should be given with great freedom; there is no drug or aliment of equal value to it. In addition to the foods mentioned above, Carrick's beef peptonoids may be employed; they contain the nutritive elements of the meat with the solid constituents of milk and gluten. This food is prepared as one mixes mustard in a cap, and is then diluted with hot water. If used as an enema, it should be given in a glass syringe, as it chokes the india-rubber apparatus. Defermented blood has been used in rectal alimentation.

Solvents.—It is highly problematical if any chemicals be known which have the power of dissolving the false membrane *in situ*. Experiments in the laboratory may give results such as clinical observation may entirely fail to endorse. A steam-spray will keep the air moist, and so afford valuable physiological assistance, and the addition of menthol will give a wholesome character to the atmosphere; whether the use of lime-water, liquor potassæ, or other reagents will do more than this appears doubtful. As regards the special value of the application of corrosive sublimate, pancreatic juice, trypsin (Lewis Smith) to the patches, nothing is known for certain; corrosive sublimate, be it remembered, is a powerful poison. If the nostrils be constantly running, or choked with discharge, a mild solution should be regularly used with a syringe for keeping the passage clear.

The same should act, before the household retires.

to rest, that she has enough coal, methylated spirit for the spray, antiseptics, stimulants, etc., and food to last through the night, and plenty of feathers and torn pieces of sponge for keeping the tube clear. It is unsafe to leave the child for a moment unattended.

There is an art in clearing the tube; when the child coughs, the scrap of sponge should not be held over the tube, but the nurse should wait until the cough has brought the thick mucus up to the mouth of the tube, then she should catch it, and prevent its being drawn down again. Every now and then a medium-sized feather should be twisted round inside the tube, to ensure a free passage, especially if there be much mucus. There should be two attendants; one for night, and another for day. They should be instructed in the art of clearing and cleaning the tube, and should have confidence for the removal of the inner tube for washing. Without the inner tube, the passage could not be kept clear; the use of an oiled feather makes it slip in and out more easily.

In the early days after the tracheostomy, there is so much viscid mucus that the inner tube is of great importance. But when matters have quieted down, and the passage into the trachea is lined with granulations, a single tube may be substituted. Baker's indiarubber tubes may be used after the opening into the trachea is well established. They are not so convenient for introduction at the time of operation as is the flat, bivalve tube. Before insertion, it should be soaked in hot water and lubricated with vasoline; oil should not be used. Its introduction may be facilitated by cutting the end obliquely, or by sending it down over a flexible catheter used as a guide; or it may be slipped in between the blades of the dilator. It gives no trouble; can be cleared with a feather; and is unlikely to set up ulceration, necrosis of cartilage, or secondary hæmorrhage. It has no

opening on its upper surface, but one can easily be made with a pair of scissors; when changing the tube a ligature metal one must always be at hand, which may be slipped in should trouble arise; indeed, one should never change a tube of any sort without having the dilator (Fig. 1) at hand.

No kind of tracheotomy tube can be worn for an indefinite time without risk of deterioration; it should be examined from time to time; the soft tube is not trustworthy unless it is made on a foundation of gutta. Should part of a tube slip into the trachea, the case must be dealt with as directed in chap. xvii. Three reports of such accidents are found in the sixtieth volume of the Transactions of the Medical-Chirurgical Society; in one case the tube was brought up by a bent wire; in the others, by a pair of slender forceps. The wire should not be too stiff, but the bent part be so firmly caught in the bronchus that it cannot be removed without damage to the mucous membrane.

Cellulitis.—The surface of the wound may take on a covering of diptheritic membrane, though this is not of common occurrence. The skin and cellular tissue in the neighbourhood of the wound may become swollen, so that the tape around the neck requires alteration; the inflammation may end in suppuration or gangrene. It is likely, however, that the child will sink ere such changes ensue. The wound may be painted with glycerine and carbolic acid, and the neck coated over with flexible collodion.

The **permanent removal of the tube** involves anxiety and patience. If the child do well, it may be taken out for as long as two on the third, fourth, or fifth day; but if there be spasm or dyspnoea, it must be slipped in again. The dilator should be at hand in case of difficulty occurring in the re-introduction. Before removing the tube, and to ascertain the

condition of the glottis, a small piece of wet oiled silk may be laid over the mouth of the tube. At each inspiration this film is sucked over the opening, and the air has to be drawn through the larynx. This frightens the child at first, but he soon gains confidence, and so prepares himself for breathing through the glottis. Or the inner tube may be removed, and the outer one blocked, so that air has to pass between the limbs of the outer tube and through the glottis; the blocked tube may be worn for several days or nights, if expedient. It may be many weeks, or months, before the tube can be omitted by night as well as by day; dyspnoea is always increased at night. Impediments to removal of tube may arise from apprehensiveness on the part of the child, diphtheritic paralysis of the muscles of the glottis, blocking of the larynx by granulation, or adhesion between the vocal cords.* Such cases are difficult to manage; fortunately they are rare. Granulation tissue and adhesions may be broken down by passing a probe through the glottis from below, or it may be necessary to divide the cricoid and thyroid cartilages in the exact middle line, and having cleared away the granulations, dried the surface, and touched it with a dull cautery, to suture the cartilage. The tube would be left undisturbed in the trachea for a few days subsequently; or the communication through the glottis may be re-established by the use of slender sea-tangle tents. If the child be very nervous the tube may be removed and the glottis exercised under the influence of chloroform. Each case must be dealt with as circumstances demand, but much anxious superintendence is demanded.

Papillomata of the larynx may not be visible on laryngoscopic inspection, but by a process of exclusion their presence may be diagnosed almost

* Thos. Smith; *Trans. Med. Chir. Soc.*, vol. xliii.

with certainty. Parker had a case of this nature in a child of four years, who had suffered for three-fourths of its life from laryngeal obstruction. There was insufficient voice for speech or cry; finally violent dyspnoea ensued; tracheotomy was performed, and warts appeared in the wound. The thyroid cartilage was laid open from the front, and the crop of warts cleared away. Recovery was complete, and voice was gradually developed. Up to the time of the last report there had been no return; and Goodhart mentions* a somewhat similar case, though eight years afterwards the boy could talk only in a hoarse whisper.

CHAPTER IV.

CERTAIN DIATHESES.

HÆMOPHILIA.

THE hæmorrhagic diathesis is an inherited defect; several members of a family may be vitiated by it. A boy, with a constitution thus impaired, was under treatment for a small contused wound of the scalp; only after a prolonged trial of styptics, and compression, could the bleeding be arrested. A brother of this boy had died to death from a scratch of the finger. Hæmophilia is a desperate complication in operative surgery; even such comparatively small matters as circumcision, the extraction of a tooth, the bite of a leech, or the division of the frænum ligæ, may give rise to fatal hæmorrhage.

As a rule, it is not a first or a second outbreak of bleeding which causes fatal exhaustion, but the

* Op. cit., p. 265.

constant repetition of the attack. A boy may lose a large quantity of blood at a hæmophilic crisis, without a fatal result, and, after the bleeding has ceased, he may make rapid progress towards an uncertain recovery. The attack may come on without warning or definite cause, or it may be preceded by head-ache and malaise. Sometimes the blood flows from the mucous membrane of the nose, the rectum, or the bladder; the gum is a frequent site for spontaneous hæmorrhage; blood may come into the subcutaneous tissue, the intermuscular spaces, or the articulations, where large blood tumours may result. Such hæmorrhages differ from those of acute rickets by their frequent recurrence or characteristic associations. Reference has been made to umbilical hæmorrhage on page 266; blood may well up through apparently sound skin, and, unable to coagulate, may flow away in a full stream. It is always from many capillaries, rather than from a large vessel, that the bleeding takes place; it is persistent rather than energetic.

If a surgeon knew that a child comes of a "bleeder" family, or has suffered from spontaneous hæmorrhage, he should decline to operate, except in the case of extreme urgency. If a cutting operation be demanded it may be expedient to perform it with the thermo-cautery. Abscess should be allowed to open spontaneously. Should the child grow up, the taint will probably render him ill-fitted for the struggle for existence. Hæmophilia is more common in boys; but the girls of a "bleeder" family, though rarely themselves the subject of persistent hæmorrhage, may beget hæmophilic male children; indeed, this is almost to be looked for. If a girl be hæmophilic, she may be the subject of serious loss of blood at the on-coming of menstruation.

Of the **pathology** nothing definite is known; it may be a disease of blood, or of blood-vessels, or of

1868. All **treatment** is unsatisfactory; the blood may come through compresses however firmly applied, and styptics may have no influence upon its flow. A fine needle run through the skin, and a twisted suture drawn tightly over it, may be of avail; the cautery at a dull heat may be tried. The strong perchloride of iron solution must be used with discretion, as it is apt to cause sloughing. It is not advisable to search for bleeding points by enlarging the wound. Indeed, Pitts is opposed to all local measures. Internally iron and cod-liver oil may be given, and any drug or food which is likely to improve the general condition. Ergot and turpentine are highly spoken of also; but no drug has yet been found of specific influence. The great point is to improve the constitutional condition. Fresh air, sunshine, cleanliness, and warmth, are of the utmost importance. If unusual vascular fulness give warning of an attack, the child may be treated by free purgation. (*Epistaxis*, page 199.)

CENTREX OUT OF CENTREX.

A child under peripatetic hygienic influence is a bad subject for surgical operation, and in his person slight injuries are apt to be followed by much disturbance. When circumcision is performed, the wound may become foul and sloughing, and the healing be long protracted. Or if such a child be operated on for hare lip or cleft palate, no attempt at primary union may follow. Such are the children with whom a slight sprain is apt to be followed by an attack of acute or chronic synovitis, or even of suppurative arthritis; and with whom an injury, which would pass almost unnoticed in a strong child, is followed by cellulitis or abscess. Many a fat and heavy child is of such weak and flabby nature; the limbs may be large and distended, and the frame apparently robust; but the bones may be soft and fragile,

the blood wanting coloured elements, the wastes ill-developed, and the power of resistance feeble.

SIRUUS AND TUBERCULOSIS.

The term "*strumous*," or "*scrofulous*," is a convenient one, but it has been so widely and variously applied that difference of opinion exists as to its exact meaning. The adjective "*strumous*" used in connection with an inflammation of a lymphatic gland, a knee joint, or a conjunctiva, chiefly implies that the subject is of an unhealthy nature, either from inheritance or surroundings; but, further, that the attack is likely to run a lingering course, and possibly to end disastrously. I agree with Holmes, that no practical inconvenience would result if the term were recognised as being devoid of definite meaning.

Though "*struma*" is, perhaps, more frequently transmitted hereditarily than all other diseases together" (Bavory), still the diathesis may be induced by over-crowding, improper and insufficient food, a lack of fresh air and sunlight, and a general neglect of hygiene. "Infants at the breast, supplied with good milk, and with plenty of it, seldom show any signs of strumous disorder; whereas as soon as they are weaned they become subject to various complaints of a strumous kind" (Watson).^{*} The breeding of infants who are born of strumous parents is a matter of prime importance, especially when the mother cannot suckle her child. "*Strumous*" inflammation is usually unassociated with much pain or redness; the skin is pale bluish, or mottled. A great feature is that the inflammation is liable to be started by insignificant causes. Thus, a strumous boy sprains his knee, and the chronic or subacute synovitis which follows ends in total destruction of the joint. Another child is capped on

* "*Principles and Practice of Physic*," vol. I., p. 297.

the wrist with a stick, and chronic abscess is the result; a third child suffers from an intractable periostitis of the tibia after a fall on the shin; and, in a fourth, ulcer or abscess refuses to yield to treatment. The strumous and tuberculous ophthalmia may not be identical, though miliary tuberculosis often follows close upon the heels of, and, indeed, may be associated with, struma. The tuberculous diathesis is, generally, an outcome from the strumous. Thus, a child with strumous disease of the knee may equally risk from the intercurrentness of tubercular meningitis (page 55). Struma may be regarded as potential tuberculosis. Savory puts it thus: "Struma is generally identical with tuberculosis; the use of the latter term, however, being often restricted to the case in which tubercle actually exists." The cheesy infiltrations elaborate a poison which produces tubercles. This constitutes the real relationship between scrofula and tuberculosis (Rindfleisch). As a rule, there is a want of muscular development in the strumous child. "Though he may be plump, the limbs are soft and flabby; the skin is fair and thin, showing the blue veins beneath it; the features are delicate; often a rose colour of the cheeks contrasts with surrounding pallor; the eyes are large and humid, with sluggish pupils and long silken lashes; there is frequently a fulness of the upper lip, and a clubbing of the fingers. To the uninitiated, such delicate children may appear beautiful." Another type comprises those who have a dark, muddy, and harsh skin, and coarse hair. All strumous children are apt to be narrow-chested. The abdomen is often prominent, and the circulation feeble. In mind and manners they are prematurely old. Many, though markedly strumous, answer to neither of the foregoing descriptions. The teeth of strumous children are often large and very white, their wide cutting edge showing a fine serration, which in time wears

away. Children of this latter type may be fairly strong and muscular.

Batlin remarks* upon the absence of characters which can be described as pathognomonic of tuberculous disease. "But, pathologically, we discover in every case, in some of the organs or tissues, small bodies, generally of spherical or spheroidal shape, but apt to lose their shape as they increase in size or become confluent."

The tubercles, or tubercular deposits, may be derived from the blood; probably they are masses of degenerate lymph. The leucocytes are packed together in a fairly fibrillar network, and in their midst may be found a many-nucleated giant cell. This giant cell may be the result of a fusion of certain of the ordinary elements of the inflammation, or it may be simply a collection of a few cells in the midst of a mass of lymph. The tubercle may be found as small, non-vascular, grey bodies of the size of millet seeds, infiltrated through the various tissues; they may determine ulceration and other complications, or, undergoing fatty degeneration, may form masses like patty or cheese (yellow tubercle). The organic parts of such a mass having been absorbed, a small cretaceous deposit may be left behind.

Ziegler remarks, that though giant cells are thought by some to be characteristic of tuberculosis, the theory is unjustifiable, the cells of tubercle being equivalent to those of granulation tissue; they arise in the same way as granulations. "It is in the glands that the tuberculous eruption is most intense. Generally the process makes a kind of halt at these gland stations."

According to Koch, the virus of tubercle exists in the bacilli tuberculosis. His theory would be; that the bacilli, or their spores, enter the system by the lungs or alimentary canal. If the patient be predisposed

* "Encyclopædia of Surgery," vol. i., p. 331.

to the reception of the poison, either from hereditary tendency, or an acquired condition, it may enter the blood, and lodge at some part weakened by injury or by previous disease, setting up the peculiar form of chronic inflammation.* These bacilli are, thus, harmless in the man with sound glands and joints; but when those tissues are below par (as after an attack of typhoid fever), to breathe the germ-laden air might be the cause of fearful disaster, or even of death. If this theory be a true one, it behooves the medical staff and attendants at a hospital for consumptives, where bacilli must needs abound, to be armed in every tissue *cap-dy-dit*. If tubercle depended upon the transmission of micro-organisms the disease ought to be found in epidemics; and places like Bournemouth and Mentone, where tuberculous subjects congregate, should be found dangerous resorts for those whose constitutions, though not strong, are not infected.

Chronic degeneration of inflammatory products is the starting point of tuberculosis; frequently, tubercular nodules are found in the chronic glands of struma, where, before death, the presence of definite tubercles had not been recognised. Strumous and tubercular inflammation specially attack lymphatic glands, bone, and synovial membrane. The trouble may come on quietly and painlessly, dragging its weary course but little influenced by treatment. For months or years tubercular deposits may remain quiescent, and then, under the influence of physical depression or local disturbance, may undergo suppuration. Cavitation and subsequent drying up are a fortunate ending of the deposit. As a result of these processes, the presence of crumbly nodules may mark the situation of demolished glands. Often when tubercular inflammation has ended in suppuration, and the complete evacuation of the abscess has taken

* Martin Beck, in the 6th edition of Erichson's "Surgery."

place spontaneously or been procured by art, rapid healing occurs. Tubercular inflammation is by no means incurable; but from that acute form of tuberculosis which is associated with the sprinkling of milary deposits through the various organs (page 53) recovery can hardly take place. So general an infection is accompanied with much constitutional distress, as shown by high temperature and extreme exhaustion.

Prognosis.—In favourable circumstances, strumous children will not only improve, but they may even shake off the effects of the diathesis. As to whether the child who has milary infiltration can recover is another question. Probably he may do so, if a thorough treatment be adopted whilst the infiltration is still localised. As Pepper remarks,* those who have had scrofulous glands or joints in earlier years are apt to fall victims to phthisis in later life.

The **treatment** of strum and tuberculosis demands fresh, dry, warm air, washing, flannel clothing; plenty of good wholesome food, rest, warm washings of the entire surface of the body, gentle exercise, mental and physical, and cheerful surroundings. The circulation is slow, and after exposure to cold the fingers become chilled and livid; cold bathing is prejudicial. Drugs to be tried are iron (in the form of tincture or iodide) and cod-liver oil, if the latter can be taken without nausea; occasional doses of rhubarb and cala may be required. Cod-liver oil may be given with nardines, but where it cannot be kept down, cream and honey form excellent substitutes. The oil must not be administered in large quantities; half a teaspoonful twice a day, after meals, is a fair dose. Every now and then the oil may be left off for a few days or weeks, so that a dislike or disgust for it may pass away. Glycerine is not an equivalent for cod-liver oil. The oil may be rubbed into the skin, when the child cannot

* "Surgical Pathology," p. 162.

take it by the stomach. Wine is not essential; spirits are actually harmful.

Such places as Blyl and Margate are excellent for residence, especially in warm weather; but in winter Haingate and Eastbourne would be preferable.

Strumous tubercle generally occurs in fatty, unhealthy-looking children. It may be that the child is being treated for some chronic affection of glands, bone, or joint, when the mother remarks that he has "something like a blind boil on his thigh." The nodules are often seen in the child who is the subject of strumous dacrylitis. Sometimes there are several strumous tubercles in various stages of development in different parts of the body. The smallest of them feels like a fine shot-pellet in the skin; there is neither tenderness nor discoloration about it. A further stage shows the tubercle larger, and nearer to the surface, and the skin around it hyperæmic or dusky. A deposit still more advanced is found as large as a bean or a dried raisin; the spot being soft or fluctuating, and the skin brownish or purple. Soon after this the thin skin goes away, and the unhealthy-looking sore which results slowly disappears, its situation being temporarily marked by a dusky staining. The best way to find the youngest of these tubercles is to smooth the hand carefully over the skin of the trunk and extremities. They probably consist of aggregations of leucocytes in a fluid, granular or slightly fibrillated mass. At first they are quite hard. To call these strumous tubercles is not to associate them with tuberculosis; the adjective describes their nature, the substantive their form only. They are appropriately called *verruca dermatosa*.

Treatment.—If the child be dealt with on the scheme laid down in this chapter, they will disappear spontaneously, either by the contents being absorbed or escaping to the surface. Simple dressings may be

needed to keep off friction by the clothes. Incision and scraping are generally superfluous, but if a chronic ulcer remained after the spontaneous escape of the pus, it should be scraped.

Streptococcus dactylitis is a rarifying osteitis of the phalanges, or metacarpal bones, in an unhealthy child. It may come on after a slight injury, but in many cases no clear history of the finger having been damaged can be obtained. The illustration (Plate I., Fig. 1) is of a case in which convalescence was prolonged by an intercurrent attack of scarlet fever.

The treatment of streptococcus dactylitis demands care and patience; the finger is apt to get more surgical interference than is required. To dissipate a red and dusky-looking finger, with a thickened bone, is a simple matter, often seems to be suggested by the case, but in most cases it is perilous. But if the finger be subjected to a small amount of compression in the dressings, the hand being fixed on a splint and worn in a high sling, the case will probably do well. At any rate, it should be afforded this chance. If the subsequent progress prove unsatisfactory, and health appear to suffer from the presence of diseased bone, amputation could be resorted to. As the enlargement subsides, minute sequestra come away, the clots disappear, and a useful though shortened digit results. Scraping might quicken the healing process, but if one begin to scrape at the soft mass the operation might end in amputation. Nevertheless, free scraping, the removal of sequestra, and the dressing with iodoform are appropriate in certain cases.

Streptococcus ulceration.—Cases of ulceration are met with in children, who, though not presenting characteristic features of streptococcus, are not robust. Such ulcers are generally quiet and painless. Though sometimes surrounded by undermined and dusky

edges, at other times they are covered with granulations, which, but for a want of energy, look promising. Healing is not influenced even by attention in the administration of drugs, the regulation of diet, and many and various applications; or perhaps the sore may heal up for a while, and then break down again. Nothing short of a thorough scraping will avail, the edges being at the same time shaved away. If the sore be upon an extremity, a splint must be applied to the limb so that perfect rest may be ensured during the healing process.

Tubercular meningitis, or acute hydrocephalus, is apt to supervene in the progress of a surgical case, rendering the prognosis desperately unfavorable. The child may not perhaps have been strumous, and, moreover, may never have given evidence of tubercular taint; but when the health and strength have been undermined by chronic suppuration, or lingering disease of spine, or joint, a highly suitable material is afforded for tuberculous deposit; and sometimes when a tedious surgical trouble seems to have passed away, death may result from tuberculosis. Thus: S. B. had been for many months under treatment for spinal caries. He was growing fat and strong, having worn a series of plaster of Paris jackets, one of which was undisturbed for nine months. He complained of headache, and was attacked with vomiting; becoming delirious, he died a few days later. Meningitis is particularly apt to follow partial operations on tuberculous bones.*

The **symptoms** may be at first obscure. The child sucks less for food; he loses flesh and becomes thrifty. He may ask to be taken to bed two or three times in a day (West). He complains of headache, and puts his hand up to his head; he is restless, and his pale face is every now and then covered with

* *Gazette des Hôpitaux*, 2nd Jan., 1855.

a bright sun. By drawing the finger nail in a slight scratch across the skin of the abdomen, a wide red streak appears (*striae ceriseae*); the abdominal wall is depressed. He grinds his teeth during sleep, and wakes up with a scream. He dreads the light, and turns over in bed to avoid disturbance. The eyebrows are knit, and the expression is anxious; the head may be hot. The child utters a short, sharp cry, and may call, "My head! my head!" The pulse is quickened, and the temperature raised. The fontanelle may be bulging; he may temporarily rally. Then drowsiness yields to delirium; the pulse becomes irregular, weak, and flickering. The pupils may be evenly contracted or differing, and often the child squints. At any period of the disease convulsions may set in, and as the end approaches coma is complete, the bladder and rectum being evacuated unconsciously. On ophthalmoscopic examination the retina is found congested, and tubercular deposits may be detected at the fundus.

Treatment and prognosis.—No treatment seems of avail when once the diagnosis of tubercular meningitis definitely declares itself. Mercury, iodide and bromide of potassium, nuxdines, purgatives, and leeches; cold to the head, and blisters, have afforded but temporary relief. If the child be constantly sick it is useless to give medicines by the mouth. When milk cannot be kept down nutrient emulsions may be administered; but it is first expedient that the bowels be thoroughly cleared, either by a full dose of calomel and jalap, or by a simple enema. The room should be kept dark and quiet; cold-water lint may be applied to the head. When the child's condition allows it, leeches may be applied, and, if expedient, the gums may be scarified; minute doses of opium may be given. Greenough advises*

* *British Medical Journal*, 1904.

phosphorus syrup, in doses of one to two minims for each year of age, which he mixes in simple syrup so that a teaspoonful makes a dose. The report given by him will no doubt induce further trial of the drug.

Rickets.—Rickets depends on a general want of nutrition; it is not simply a weakness of the bones. It is essentially an English disease; practitioners from our colonies are astonished at the number of subjects in the out-patient department affected with it. (There were definite signs of rickets in about 30 per cent. of the children under my care in the out-patient department.) The disease abounds amongst the offspring of the London poor; and those children who come last in a family are more apt to be rickety than the first. Exposed to similar prejudicial influences, some children will become strabismic, others rickety; probably some hereditary peculiarity determines the inclination to this or that disease. Barely are tubercular children rickety; hand-fed infants are much more liable to rickets than those who are suckled, especially if they have been reared on condensed milk or a farinaceous diet; and even the children of well-to-do parents are apt in these circumstances to show signs of rickets. It appears impossible that rickets is closely associated with, or dependent upon, syphilis, for the first children of syphilitic parents show clearest signs of syphilis, whilst the contrary holds with regard to rickets.

One of the earliest **symptoms** is a restlessness at night, and a kicking off of the bed clothes. Many rickety children perspire freely during sleep, so that the pillow is wet; but if a child kick off all the clothes he becomes chilled and then perspiration does not cease. It is not understood why rickety children kick off the clothes. It has been suggested that it is because the body is tender, and cannot tolerate the heat pressure; but the rickety child is not so tender as this would

imply. Some writers have suggested that the thickening about the extremity of the long bone is of the nature of inflammation of the epiphyseal cartilage and the periosteum; but if this were so one could scarcely handle the enlarged wrist, or press over the beaded ribs without causing pain. In the general run of cases there is no definite tenderness; the child is feeble, helpless, and fretful, but not in pain. He is usually backward, and tumbles about, or crawls, at an age when he ought to be able to walk securely. As Eustace Smith remarks, a healthy child delights in movement, a rickety child is happy only when at rest.

The **head** is expanded, the forehead large, and the face puffy. The borders of the parietal bones are swollen, so that the sagittal suture is thickened; but ossification is so delayed that the anterior fontanelle, which should be closed before the end of the second year, remains wide open months later. The thickening of the parietal bones may produce a definite, though shallow furrow along the sagittal suture. The occiput may be found flattened if it be constantly resting upon the pillow, and on the nurse's arm. And either from the pressure of the brain from within, from absorption, or from retarded ossification, a thinning of certain parts of the parietal and occipital bones is produced (**cranio-tabes**). (See also page 72.) The soft spots may be detected by pinching the postero-lateral parts of the head between the finger and thumb; it is as if the bones had been patched with a piece of parchment. **The teeth.**—When rickets appears in early infancy, the eruption of the incisor teeth may be delayed. If the disease appear after the cutting of the incisors the eruption of the molars may be retarded. A case has been recorded in which a rickety child of nearly two years had cut but four teeth.

The **bones of a rickety child** are deficient in earthy matter, and yield to experiment pressure.

The femur, tibia, and fibula bend either in the direction of their natural curves, or in other ways. If the child content himself with crawling, the bones of the arms may be deformed. The spine bends in a loop curve, and may be so weak that the head hangs down upon the chest. Want of nutrition affects the development of the bones, so that the rickety youth is generally stunted as well as bandy or knock-kneed.

The ribs yield under atmospheric pressure, so that the child is **pigeon-breasted**. This deformity consists in the lateral compression of the chest walls, at about the junction of the ribs with their cartilages. (See page 93.) The anterior extremity of each rib and the adjoining piece of costal cartilage are expanded, so that a series of "bumps" suggests the term "rickety rosary." A child may be rickety without presenting this sign, the expansion of the end of the rib being almost entirely on the pleural aspect.

The **anatomical characters** of rickets, as given * by Niemeyer, consist in proliferation of the cartilage of the epiphysis, and of the periosteum, which are the sources of the normal growth of the bones in length and in thickness. The cartilagenous and fibrous tissues resulting from this proliferation ossify more incompletely; the deep layer of the periosteum at the end of the bone is found thickened and abnormally vascular, and its soft tissues showing little inclination towards ossification. The cells of the epiphyseal cartilage are formed in vast numbers; they are swollen, and heaped through the matrix without histological order. Thus the extremities of the long bones are expanded, especially the carpal ends of the radius and ulna, the tibia and fibula being affected in a less degree. When the extremity of the radius is much expanded the wrist looks as if it possessed an articulation above the swelling as well as below it; and the child is then

* "Practical Medicine," vol. ii., p. 209. Revised edition.

described by the mother as "double-jointed." Unless the rickety diathesis be effaced at a tolerably early period, a definite trace of the enlargement of the end of the radius will be distinguishable through adult life. The **abdomen** is enlarged, and is widened, even up under the false ribs. This is not generally due to increase in size of liver or mesenteric glands, but to distension of the intestines, for there is resonance on percussion. The prominent abdomen, and the chest compressed from side to side, are characteristic of the disease. (See Plate II.) The motions are irregular and offensive; and the gas evolved by fermentation of the food causes the alimentary canal to be inflated.

Median furrow.—One feature in connection with the tumid abdomen is that the linea alba yields, and becomes frayed out; the straight muscles of the abdomen being then thrust from each other under the constant pressure from within the cavity, till at last a wide gap is left between them, from pubes to sternum. Through this gap the intestines bulge when the abdominal muscles are thrown into action, as in an attempt to sit up.

The **pelvic bones** become crumpled up, and especially so if the weight received by them be increased by the weak spine being fitted with a steel "support." Laryngismus stridulus is often associated with rickets. Sometimes one finds the humerus curved from the mere contraction of the deltoid. But the child may grow out of all these deformities, provided only that he be kept lying down until his skeleton is more strongly developed, due attention being paid to matters of general hygiene. It may be advisable to submit the bones of the fore-arm to gentle compression on a splint.

Treatment.—The child should be kept evenly dressed, and always warm, and the air and the food should be fresh. As regards drugs, reference may be

nude to page 55. The child must not be allowed to walk or sit until the bones and ligaments are strong enough to support the weight. He should be kept lying about, and should have his meals and toys upon the floor. The administration of phosphorus in minute doses has acquired considerable reports in the treatment of rickets, and of the deformities resulting from it. The most convenient preparation of the drug is the clean phosphorus, in doses of from one to six minima.

SCURVY AND RICKETS.

If an infant have been brought up on farinaceous food, or on condensed milk, or on the two combined, he is apt to become flabby, weak, and markedly rickitic.* A diet exclusively of bread-and-butter may induce the condition in an older child. The ribs will be beaded, the epiphyses swollen, and the head wet with perspiration; there is little or no elevation of temperature. The gums are spongy and swollen, and bleed at the least touch, and hæmorrhages take place into their substance, making them look as if bruised. If treated in time, the scurvy rickets may cease to advance, but if no improvement be effected in the hygiene, hæmorrhages may occur beneath the periosteum of the femur, tibia, or of other bone; into or beneath the skin, the conjunctiva, or other mucous membrane, or amongst the muscles. I have seen an enormous extravasation between the gastrocnemius and soleus. The infant lies uneasy, and is constantly moaning, and he cries out when the swollen limb is handled; the skin is glazed from tension beneath, and the limb appears paralysed, probably because it is too heavy or too painful for the child to move it. The swelling, which has come on quite suddenly, extends around the limb, and gives no sign of fluctuation beneath. In certain rare

* *Trans. Path. Soc.*, 1853, by Barker and Page; "Year Book of Treatment," 1864.



instances the epiphysis is detached from the shaft. A fine needle and trocar thrust into the swelling find the bone bare, and on the withdrawal of the trocar a drop or two of dark blood escapes, but no pus.

Treatment.—Recovery takes place under the influence of cleanliness, warmth, fresh milk, cod-liver oil, sweetened orange juice, and fresh vegetables. For the swollen limb, elevation, gentle massage, and dry compression will be expedient. Small doses of quinine and iron may be administered; no active surgical treatment is required. Under the improved hygiene, the blood clot is readily absorbed; detached epiphyses again adhere to the shaft; the periosteum resumes its connection; the swelling of the limb disappears, and the child completely recovers.

Fœtal rickets is a name given to a condition occasionally observed in the new-born infant. The body of the rickety foetus is rounded, and laden with fat; the belly is tumid; the limbs are stunted, and marked with transverse folds. The shafts of the long bones are short, thick, and bent, and the ends of the ribs beaded by the development of a cap of bone around the costal cartilage; the head is large. These infants may be regarded as belonging to a pronounced fœtal type of cretinism. They will probably perish at or soon after birth.*

Rickets in adolescents makes its appearance at about puberty. It is an association of weak ankles and flat feet, and albuminuria. Lucas attributes it to the effects of excessive masturbation.†

* Transactions of the Pathological Society, 1894; and vol. xxvi., page 204.

† British Medical Journal, 3 May, 1888.

CHAPTER V.

SYPHILIS.

SYPHILIS may be congenital or acquired. I have had under treatment a boy, of nine years, who had a Hunterian sore upon the prepuce, and chancrelata at the anus; he had received contamination from a girl of the same age. When secondary symptoms appear upon a precocious child it will be well to make an examination of the lymphatic glands in the groin, and of the parts associated with them.

Inoculation may be received from a syphilitic wet nurse, from kissing a syphilitic child or other infected person; from an infected spoon or toy, and from careless vaccination. The primary infection may have attracted little or no attention until the secondary symptoms appear. The course taken by acquired disease is like that seen in the adult. I have never met with a case of **vaccino-syphilis**. In England, where vaccination is performed with fair discretion, such cases very rarely occur. If a little more care were exercised in the matter of improving the general health of an infant before subjecting him to vaccination, there would be still less complication, and wild and ignorant objections to it would decrease. Vaccination should never be performed from an infant about whom there can be the least suspicion of venereal taint; nor should lymph be taken from a puffy or unhealthy child. The lymph should not be stained with blood, as the blood, not the lymph, probably conveys the syphilitic infection. The family history of the child from whom the lymph is obtained should be known to be good. Should syphilis and

cow-pox be inoculated together, the vaccine disease would have run its course, when the inoculation wounds become indurated and ulcerated, and the axillary glands would be enlarged. Confirmatory evidence of syphilitic infection would be afforded after a few weeks, when roseola and other affections would appear.

In the case of **hereditary disease**, the taint may have been received from either parent, but when the disease has been recognised, it is the duty of the medical attendant to discover which of the parents is affected, and, if possible, not to allow further cohabitation until the secondary symptoms have entirely disappeared, under the usual treatment (Holmes).

Symptoms.—The subject of congenital syphilis is apt to be of premature birth, and he may be a mere bag of bones. At birth, however, a syphilitic child may look strong and plump; gradual emaciation may suggest syphilis, even before any other symptom attracts attention. There may be history of miscarriages, or of infants dying soon after birth. "When the manifestations of syphilis are delayed beyond the third month, it may generally be anticipated that the complaint will assume a mild form, and yield readily to treatment" (Alfred Cooper). The skin and the mucous membranes, generally, are the first to show signs of disease, but even in the early weeks of infancy an obstinate sleeplessness may suggest the presence of the taint (Easton Smith). The sleeplessness may be the result of bone pain. A faint macular eruption may be spread over the body, being most marked about the gluteal folds and the genitals, and sometimes the skin is raw in patches. A dermatitis about the pelvic region of an infant is not necessarily of syphilitic origin, even when associated with a plentiful outbreak of papules and vesicles. Often it is due to the irritation of napkins saturated

with urine or feces, or which have been washed with soap or soda. The nates, thighs, and perineæ, must be kept clean and dry, and napkins and towels should be soft. The skin of the buttocks and thighs may be red, hot, and excoriated, but with simple attention the local trouble disappears.

An eczema which extends up the abdomen and down the lower parts of the thighs, that is, to beyond the region enclosed in the napkins, is of syphilitic origin. The simple dermatitis *adiposa* reaches below the saddle of the thigh. Pimples is a dangerous manifestation.

The **nasal mucous membrane** is in a condition of chronic inflammation and ulceration, so that there is constantly a thin or purulent discharge from the nostrils. This causes no impediment to the passage of air, and the infant is said to have "**snuffles**." When the nares are blocked the infant can breathe only by the mouth, he cannot suck and breathe at the same time without sneezing and suffocation; he refuses the breast, and wastes rapidly. If the ulceration continues, blood may be mixed with the mucus, and the development of the nasal bones may be affected; or caries and necrosis may cause the roof of the nose to fall in. There may be Herpes, fissures, or *condylomata*, at the angles of the lip, which may heal with linear or general contracture (Fig. 22).

These lesions are highly characteristic, as are also cracks and sores between the fingers and toes. Pain and bleeding attend stretching, and suckling and defecation cause much distress, when the skin or mucous membrane is thus bound. Small ulcers and *condylomata* may be found at the anus, and **condylomata** may appear about the scrotum and thighs; occasionally one sees them on the sides of the transverse diameter of the neck, thigh, and arm, and that even in well-developed, though syphilitic, children. Wherever

condylomata are apt to appear, these also may be found raised "mucous patches;" their surface is moist, pearly grey, slate-coloured or dusky. They are large clusters of small condylomata (Plate III. Fig. 1). Papules and patches may be found upon the walls of the pharynx; and when ulceration has been followed by cicatrization and contraction, strange adhesions may be detected between the soft palate and neighbouring mucous surfaces. The history and the appearance of the child suffice to distinguish such adhesions from those of tabular disease.

The epidermis is apt to be detached from the palms and soles, either with or without the occurrence of vesicles or bullæ. This is almost pathognomonic of hereditary syphilis. Altogether, the skin of the infant has a dirty, mottled look, and falls in umbiliciform wrinkles over the miserable trunk and limbs, and it looks prematurely old. The nails are ill-formed and friable, and pustular sores may be found upon the adjoining skin.

Gummata are met with in the later months or years of the disease. They may be situated within and beneath the skin or mucous membranes, or in connection with periosteum, bone, or lymphatic gland. The bone and periosteum may be swollen and tender from inflammation, without the occurrence of gummy deposit. Gummata may grow quietly, like a chronic abscess, and, being opened in error, or undergoing spontaneous evacuation, their situation is indicated by a deep excavation or dense cicatrix. I have met with such a *gumma** in the thigh of a girl, five years of age, who had, at the same time, an ulceration extending through the soft palate, and deeply excavating the tonsil. She had become deaf on each side from syphilitic otitis. I have lately had under treatment two little boys, brothers, with perforation

* *Brit. Med. Journal*, 21 Jan., 1879.

of the hard palate, from syphilitic cancer or necrosis. They had previously been under the care of Mr. Anderson Critchett, for carcinoma. As one of them was in worst condition a plastic operation was performed upon the perforation, and with complete success.

Syphilitic osteo-chondroitis may, in some few cases, afford the only evidence obtainable of hereditary disease; the affected limb quickly becomes motionless. From the sudden onset of paralytic symptoms, this condition has been termed *paralytic pseudo-paralytic osteo-chondroitis*. One infant had a wide osseous thickening around the upper epiphyseal cartilage of the humerus; there being no other trace of disease, and the arm appeared paralysed. In another, all the epiphyses were enlarged, and, as distinguishing the condition from rickets, the swellings were extremely painful. There was no bowing of the ribs or other signs of rickets; and the child's aspect denoted syphilis, not rickets. When only one epiphysis is affected the diagnosis is simpler, as rachitic enlargements are symmetrical. Another infant was seen with Dr. Deskes; the left leg and thigh lay motionless; there was some little tenderness above the condyles of the femur; the thigh was slightly wasted, but all the joints moved freely. The condition quickly yielded to small doses of grey powder. In suspected syphilis, each epiphyseal cartilage should be gently squeezed between the finger and thumb; in obscure cases, strong confirmation of suspicion may be thus obtained.

Separation of the epiphysis is a rare condition. The first signs to attract attention are the helpless condition of the limb, and an arrest of its normal development. Inasmuch as the power of movement quickly returns under the influence of the mercurial treatment, the condition deserves its highly

ticks, *pseudo-paralytic syphilitic perichondritis*. The last word, *perichondritis*, points to the trouble being at first confined to the region of the epiphyseal cartilage. Sometimes this perichondritis is the only manifestation of the congenital taint.

Case.—An infant was brought on account of some obscure trouble of the shoulder; she was restless, and seemed unable to move the arm; the shoulder was swollen and tender. There was no history of injury; the mother had previously had four miscarriages, all at the seventh month; this child, though born at full term, had “*suffered*.” Syphilitic inflammation was suspected, but, in the absence of more direct evidence, a tentative treatment was adopted, but with no resulting improvement. On a course of injection the child at once improved, and the thickening disappeared.

Whenever the presence of syphilis is suspected in an infant who is the subject of some obscure malaise, it is advisable to run the fingers over the epiphyseal regions of the long bones, for thus, at times, strong confirmation of suspicion may be obtained.

In another case, the pseudo-paralysis was coexistent with cranial bones and other signs of inherited syphilis; and, except for these manifestations, the enlargement at the ends of the long bones might possibly have been mistaken for rickets. But the ribs were not beaded, and the bone enlargements were not symmetrical, as would obtain in rickets.

This lesion must also be distinguished from infantile paralysis, a disease of somewhat later months, and one which is characterized by the suddenness of its onset. The neighbourhood of the joints is, however, spared in infantile paralysis, and the range of movement which can be imparted to the limb is not diminished. By the way in which the disease clears up under mercury, the diagnosis becomes absolute. From traumatic synovitis the diagnosis is easy.

Pseudo-paralytic perichondrosis is not uncommon, yet one sees few instances in which the dissolution of the junction cartilage has advanced so far as to complete the separation of the epiphyses. In some such cases crepitas could be obtained, but the epiphyses would unite again on the child being put under mercurial treatment. In one case post-mortem examination showed the various articulations affected to be full of pus. Warrington Howard produced similar specimens at a meeting of the Pathological Society in the year 1877.

Diffuse osteitis may cause hypertrophy of the bones and sclerosis. A girl is now under treatment whose right tibia is thickened, and increased in length by one and a half inches. Gouty, necrosis, and cysts have been associated in the same limb. She has notched teeth and other signs of hereditary taint.

Nodes may be found upon the long bones as well as upon the skull. They will vary in size with the state of constitutional condition, and may undergo almost complete absorption. They are likely to be a late manifestation of the hereditary taint. Warmth and careful feeding, iodide of potassium, cod liver oil and iron, together with an occasional course of mercurial inunction, help in promoting their disappearance. Dactylitis, and the cutaneous tubercles which are often associated with it, were at one time thought to be the result of hereditary syphilis, but such association is generally accidental. The fact of the finger getting well, and the cutaneous tubercles disappearing under the improved hygiene which accompanies the so-called anti-syphilitic treatment, is not evidence of the syphilitic diathesis. Sternomastoid tumours once were thought to be syphilitic because they disappeared under a course of mercury; but they get well without it.

Cranio-tubes has been alluded to in the chapter on rickets (page 61); but in connection with hereditary

syphilis Elsässer, Barlow, and Loeb have directed attention to an abnormal thinness of portions of the parietal and occipital bones, making them to yield to moderate pressure, and to impart to a finger pressed upon them a sensation like that derived from stiff parchment, or from the surface of a bladder.* These patches are probably the result of delayed ossification of the skull walls, and their existence is not conclusive evidence of syphilis. They are often found in those who are neither syphilitic nor rickety, but simply ill-nourished. Certainly, a great proportion of children with cranio-tubes are syphilitic; Barlow and Loeb think even at so high a percentage as forty-seven. But the fact of the condition being frequently associated with laryngismus stridulus suggests its dependence on rickets.

Cranial bosses

have been described by M. Parrot as proof of hereditary syphilis. They are

flat, bony elevations of the frontal and parietal bones at the corners of the anterior fontanelle; their presence is detected, if not by the eye, by running the hand over the skull. In some cases the masses are very prominent, and appear as sudden upheavals of the external table, so that the outline of the head is suggestive of a hot cross bun; the head is often spoken of as *antiformis* (Fig. 4). It is uncertain to what extent these bosses may be taken as evidence of syphilis; a similar condition is met with in the rickety child.

If **interstitial keratitis** take place, it will

* *Trans. Path. Soc.*, 1881.



Fig. 4.—Cranial bosses in a syphilitic child.

probably be when the child is between the ages of five and fifteen years, and it may be with or without lentic, more often without. A central haziness appears in the cornea, which may gradually extend towards the periphery. Thus, the cornea looks like ground-glass, some parts of it being more flecked than others. Sometimes the cornea is studded over with fine white dots, which remain separate, and each cornea may be implicated. These lesions may be unassociated with photophobia or lachrymation. It is surprising how, under mercurial treatment, the cloudiness fades away, though frequently a slight opacity persists; the pupillary border of the iris may remain irregular, from nodular deposits of lymph and from adhesions.



FIG. 2.—Syphilitic Teeth.

Deafness, which is not a constant symptom of hereditary syphilis, may be the result of an inflammatory thickening of the middle ear or Eustachian tube, or of cicatrization of ulcerations at the aperture of the tube. Or the loss of hearing may be due to an affection of the auditory nerve or its terminal filaments; such deafness is irremediable. Deafness may come on with the eruption, or may follow it at a distance. If it appear during infancy, or early childhood, the subject may be also reckoned dumb, though, by Van Praagh's system of lip-reading, he may be taught to read from the lips and also to speak.

The **voice** of a syphilitic infant may be faint, or hoarse and hoarse, from chronic laryngitis. This may depend on exudations about the cords, or on more inflammatory oedema of the lining of the larynx.

The **teeth of the permanent set**, especially the central incisors of the upper jaw, may exhibit characteristic notches; this pair Hutchinson calls the

"nose teeth" for hereditary syphilis (Fig. 5). They often "slant towards each other, are discoloured from defect of enamel, and each shows in its edge a broad notch." These, and the neighbouring teeth, may be dwarfed and asymmetrical, and their corners rounded off. Sometimes the margin is occupied by small wart-like spines of dentine, which quickly wear away with use, leaving the notch conspicuous. The lower teeth may be peg-like, or studded with excrescences. Sometimes only a lateral incisor or a canine tooth is marked. These signs may be associated with keratitis.*

Bad teeth are no evidence of syphilis; and because a child is the subject of hereditary taint, the permanent teeth will not necessarily give evidence of it.

Mercurial teeth.—If during the development of the teeth the child be brought so fully under the influence of mercury that stomatitis occurs, the enamel may be found "defective, pitted, and discoloured."

Treatment.—The child should be warmly dressed and carefully and regularly fed, and he must not be exposed to cold or wet. Mercury improves his condition as by magic; whilst being brought under its influence he grows fat, wholesome, and contented. The drug is conveniently administered by the skin. A piece of blue ointment, of about the size of a bean, is placed upon a fold of flannel, and secured by a roller to the side of the child; the region for the insertion may be changed each day. Fresh ointment is put on the flannel every day, but the flannel is used continuously, dirty as it may look. "This causes neither griping nor pinging; in a child it does not even in general cause soreness of the gums. I have not seen a single case in which this method of treatment has failed" (Sir B. Brodie). Mr. Boon, of St. Kitts, anoints the syphilitic child with blue ointment, and

* "Illustrations of Clinical Surgery;" *Encyclopædia* &c.

leaves it naked in the ear. Salicine and wartata are of much therapeutic value. If it be expedient that the nature of the treatment adopted be concealed, one grain, or two grains of grey powder may be administered in some coloured sugar twice a day. For some emaciated children, the ingestion of the Hec ointment with cod-liver oil, persistently carried out, is of great value. The cod-liver oil ingestion is especially useful when an infant cannot derive proper supplies of nourishment from the breast on account of the stiffness in the nose. The treatment will be assisted by a washing of the body with warm water and soap, morning and evening. The treatment by ingestion is continued for six or eight weeks, or longer if necessary. I do not remember ever to have seen a child salivated.

Condyloemata and mucous patches may be dusted over with starch and calomel, and kept clean and dry. This dusting-powder may be used for the moist surfaces like talc-powder. If the condyloemata be at the verge of the anus, in the fold of the buttocks, or between the thigh and scrotum, the opposed surfaces must be separated by a small piece of absorbent cotton-wool, on which calomel has been dusted.

In later stages, especially if testes be involved in the disease, iodide of potassium in three-grain doses, taken in plenty of sweetened water, may prove of service. Children are constantly besought for further treatment on account of relapses, especially if instructions hold down as previous remedies have not been carried out; but with prolonged and careful supervision the disease can be brought into complete and permanent subjection. Foul discharges from the nose should be treated by frequent irrigation, or gentle syringing, the head being allowed to hang forward during the process. Calomel or iodoform dust may then be blown up the nostrils.

CHAPTER VI.

RACHITIC DEFORMITIES OF THE LOWER EXTREMITIES.

Genu valgum, or knock-knee, is common amongst rickety children, and unless attended to it is apt to persist, in even a more marked form, in adult life. But, considering the number of valgus children that one sees, and being fully aware of the imperfect way in which one's instructions are usually carried out, it is surprising that the number of knock-kneed adults is not larger. The delusion is that feeble children grow out of their deformity; but to leave the disfigurement unaltered by, and to promise that the child will grow out of it, is to court disappointment.

Genu valgum is usually associated with, if not determined by, a relaxation of the ligaments of the ankle and foot; the knock-kneed child is generally flat-footed. The anatomy of knock-knee is more fully treated elsewhere.* The tibia having lost much of its support at the inner ankle, the upper surface of its head receives the weight unevenly from the femoral condyles, the outer tuberosity getting more than its due share. This extra pressure causes some arrest of growth of the outer condyle of the femur, whilst, under the diminished pressure, the inner condyle grows abnormally. This elongation of the condyle is usually associated with an inward curve of the lower third of the femur, which still further lowers the level of the internal condyle (Macewen). In some instances it is at the internal tuberosity of the tibia that the growth of bone takes place, with considerable thickening at the

* *Journal of Anatomy and Physiology*, 1872.

inner side of the epiphyseal cartilage. Sometimes, indeed, a large irregular tubercle of bone is found just below the inner tuberosity of the tibia. Such an outgrowth may possibly correspond to the thickening which one observes post-mortem in the concave side of a curved, bony bone, an attempt on the part of nature to supply a localized weakness in that part.

The deformity is especially apt to be found in those who have been brought up on condensed milk or on a farinaceous diet, and who have been surrounded by a generally defective hygiene. Such have usually a heavy trunk, and a large head, which the weak-jointed feet and legs are unable properly to support. The ligaments yielding, the distribution of the joint pressure is disturbed; when once started the deformity increases rapidly. Probably heredity has but little direct influence on the condition, though parents of feeble constitution, themselves valgus, are likely to beget weak-kneed children. An excessive amount of standing,



Fig. 5.—Extreme Genu valgum; from a photograph.

or the carrying of heavy weights, has a prejudicial influence. Weakly children should not be allowed to carry about small brothers and sisters, nor help in the heavier matters of housework.

Sometimes one leg is valgus while the other is bony. The explanation of this association is from the mother carrying the child always on one arm,

whilst she throws the other arm around the knees to make them fit into the hollow of her waist. Thus, if the child be carried always upon the left arm, the left leg will be valgus whilst the right will be bowed.

In order to estimate the amount of deformity, the leg should be fully extended, so that the lateral ligaments of the joint may be tightened, and the tibia rigidly locked upon the femur. The patella, which is apt to be displaced over the external condyle, must be made to look directly upwards. For with but a little flexion of the joint, sufficient rotation and rocking of the head of the tibia may be obtained to efface all the valgus deformity. In most of these cases there is, at any rate at first, a considerable loosening of the joint. On the outside of the extended valgus knee, the thick fascial insertion of the *biceps vagus femoris*, and of the *great glutæus*, is evident along the front of the biceps tendon. This ilio-tibial band has no concern with the production of deformity. Other ligaments than those of knee and ankle are slack and inefficient; thus, abnormal movements may be detected at the elbow.

Symptoms.—Even when the deformity is little marked, the child may complain of pains in the leg and knee, especially after much standing or exercise. Sometimes there is tenderness over the inner side of the knee; such pains are occasionally mistaken for chronic rheumatism, sometimes they are called "growing pains;" this is not, however, to offer an explanation for their occurrence. They are the result of strain of ligaments, and of pressure upon delicate bone-tissues.

To obtain a record of the amount of deformity, the child should be seated upon the table, with his legs fully extended, and the patellæ directed upwards. A sheet of paper, large enough to reach from the ankles to above the knees, is placed beneath them, and by a pencil held vertically, a tracing of the limbs taken.

The distance between the ankles may be noted in inches.

Treatment.—The child must be taken completely off his feet, and the improvement of his general health sought by the adoption of such measures as advised under the head of rickets (page 68). Apparatus should be supplied with a view to prevent, not to assist, the child walking. A splint tied along the leg



Fig. 7.

of a child who is allowed to walk about, is useless; iron is as inappropriate for little children as they are expensive. For a time the child may fret at being taken off his feet, but he soon submits with resignation.

A plain wooden splint, padded on one surface, should be applied along the outer side of the limb; it should be long enough to reach from the top of the thigh to six inches beyond the foot. The limb is then braced firmly against the padded side of the splint, by wide webbing-straps and buckles, the strap which passes around the knee being drawn most tightly. The surfaces subjected to pressure should be carefully protected. The splint is applied to keep

the child from putting his foot to the ground, till the bones and ligaments are strong enough to support the weight, and also that there may be a gentle and continuous pressure exerted against the lateral angle of the knee. Bandages of elastic webbing exert so much pressure that they cannot be trusted; they may cause ulceration. Every night, and occasionally in the day, the apparatus should be removed, and the foot and legs rubbed; and by judicious, firm, and repeated efforts, the parent or nurse should endeavour to straighten the extended limb. From time to time



Fig. 1



Fig. 2

also the surgeon should manipulate the limb, and should satisfy himself that the nurse understands, and efficiently carries out, instructions as to rubbing, kneading, and manipulation.

If both limbs be slightly valgus, a firm, flat pillow may be fixed between the knees, and the ankles tied together by a handkerchief, or secured by a strap. This method should be carried on day and night, and to prevent any rotation of the tibia, a sand-bag may be kept across the knees as the child lies. But if the deformity be extreme, or the improvement unsatisfactory, more vigorous measures may be demanded. The child must still be kept off his feet, and the limb secured in some form of trough splint, and submitted to greater straightening force by means of an arrangement of straps and buckles. Careful washing, rubbing, oiling, and padding will be needed to prevent the effects of chafing or pressure.



Fig. 8.—Straight Trough Splint of Double Knee-Joint.

Or the gradual straightening may be effected by an outside iron splint, the rod of which is fixed to the foot, and has an antero-posterior hinge at the ankle, and a lateral one at the knee. This latter hinge works with a rack and pinion. Every other day the surgeon straightens a little by the key. The strap which passes round the inner side of the knee should be padded and carefully adjusted, and on the slightest increase must be removed (Fig. 9).

Operative measures.—If the child be young, and money be not forthcoming for an appropriate splint, or there be no one to look after the case,

forcible straightening of the limb may possibly be advisable. One is told that the younger the child the more unsatisfactory is the result of forcible straightening; but to this the rejoinder is, the younger the child the less the need for such rough handling. When the valgus child is one of a large and poor household, with nobody specially to look after him during the day; and when the

defect is not severe enough to demand admission to a hospital, something more than advice (which can hardly be carried out) is required. After an operation, when the limb is fixed in plaster of Paris, more domestic interest is taken in the little patient, and considerable advance may be made.

The **forcible straightening** of the limb is effected when the child is under chloroform. The surgeon holds the thigh in one hand, and the middle of the leg in the other, and with his knee placed near, or against, the prominent angle of the extended knee of the child, he straightens it gently yet firmly,



Fig. 5.—Mechanical
Appliance for Knock-knee.

as he would a stick. Or the *redressment* of the limb may be effected against the mattress, or over a sand pillow. The limb is afterwards put up straight in splinting. It is impossible to say what happens during this manipulation; probably a condensation of tissue takes place about the inner side of the articulation; sometimes, it may be the external lateral ligaments yield, a gap being left between the external condyle of the femur and the head of the tibia, and sometimes

an epiphyseal cartilage becomes partially detached. I have often had occasion to adopt the method, and have been well satisfied with the results. But when it is remembered that the operation is best adapted for rickety children under twelve years (for whom the more gentle and continuous treatment described above would be well adapted) one would hesitate to recommend it, except in certain troublesome and unsatisfactory cases which cannot be taken into hospital or be properly attended to at home. Reeves computes* that at least 360 cases have been subjected to this treatment, and with but two deaths, one from septic fever, the other from pyæmia.

(It is highly probable that when a young child has been subjected to osteotomy, and by the use of a certain amount of force the limb is put straight, the improvement is effected by *redressment force*, rather than by any advantage gained by an incomplete section of shaft or condyle.)

Various are the cutting operations for straightening a valgus limb. Some consist in partial or complete section of the diaphysis of the femur, by chisel or saw, whilst others are directed to the condylar extremity.

Age for operation.—In answer to questions by letter, Ogston expressed his opinion that most cases of knock-knee under puberty are curable without a cutting operation. He minutely carries out the Listerian precautions, and had never heard of any bad result except in the cases of Barker and Thiersch. By "bad result" probably a *fatal* one was meant, for a temporary or permanent stiffness has at times followed the performance of the operation in other hands. Adams considers that osteotomy should not be performed on very young children; for them, splints, bandages, and constitutional treatment should suffice.

* "Bodily Deformities," p. 337. 1890

Barlow would not operate earlier than the sixth year.* Macdewen would not operate on any patient under nine years of age at the very least. He would prefer them to be fifteen years of age, or more;† Barwell would not operate before the seventh year.

The cases in which **section of the biceps tendon**, the iliofemoral band, or the external lateral ligament is required, must be rare. One would fear that permanent weakness of the joint might result, and that the subject would have to wear for the rest of his life some special support. Langenbeck practised the operation on rickety valgus children with success. It has happened that in dividing the tendon the external popliteal nerve has also been cut, with the result of a temporary or permanent paralysis of the muscles and skin supplied by its branches.

Ogston's operation.—Ogston, of Aberdeen, proposed to correct the deformity by a subcutaneous section of the inner femoral condyle (Fig. 16). By a narrow incision, leading obliquely to the trochlear surface of the femur, a groove is prepared for the blade of an Adams' saw, and the condyle is cut off. The section need not be completed by the saw; the condyle would be pushed up by forcible straightening. At the Copenhagen Congress Professor Ogston confessed to the superiority of Macdewen's operation over his own. "At the same time, the history of antiseptic osteotomy must always recognise in Ogston its pioneer."‡

Reeves's operation is a modification of Ogston's. He uses the chisel instead of the saw, and having cut partially through the condyle, displaces it upwards, by forcibly straightening the limb. He is of opinion, that by carefully limiting the amount

* "Barwell's Lectures," *Brit. Med. Journal*, 21 Feb., 1883.

† Discussed at Cork, 1879.

‡ *Manual of Surgery*, Vol. I.

of work done by the chisel and mallet, he can force up the internal condyle of the femur without opening the joint; he operates with the knee bent; he considers the operation to be extra-articular. Reeves has informed the author that he has now performed the operation of osteotomy for genu vulgus 165 times in all and without any protecting influence from spray or gauze, and has never had a fatal result, joint abscess, or ankylosis. The element of danger, provided only that common sense precautions be taken, cannot, therefore, be a large one. He dips the blade of sawpel and osteotome in carbolic oil, and covers the wound with dressing impregnated with the oil. The limb is fixed in plaster of Paris, and an ice bag is applied. In about ten days the dressing is removed and the knee gently flexed. Every day subsequently the splint is removed for the same purpose. The early, passive movement he considers of importance.



Fig. 15—c. Line of Osteotom's Incision. b, Reeves's; c, Macewen's.

Macewen's operation* consists in making an incision down to the diaphysis a little above the internal condyle, and partly cutting through the bone with mallet and osteotome. This latter instrument is of special temper, and is graduated so that the surgeon may correctly estimate the depth to which its cutting edge has penetrated. Its cutting edge is the same on either side, and is not like that of a chisel. From time to time, during the operation, an attempt may be made to straighten the femur by force, either by bending or breaking through the bone tissue which has not been divided. The operation is performed on the Listerian method; the knee is supported on a reclined and

* "Osteotomy," 1893.

pillow. For the general run of cases, Macdew's operation is to be preferred to all others. It is simple, and almost bloodless, and is so far away from the knee joint that the risk of the occurrence of articular inflammation, or stiffness, is slight; it is, also, well above the epiphyseal cartilage. Some surgeons, myself amongst the number, prefer to perform Macdew's operation from the outer side of the limb. The use of Emmert's tool is not advised.

Advice to the osteotomist.—Operation being demanded, the surgeon will assure himself that the child is in a proper state for the ordeal; that the urine is free from albumen, and that the temperature is not foretelling a coming storm; that the throat is not sore, and that there is no scarlet fever about. The instruments, the part to be operated on, and the hands of the chief and of his assistants, should be scrupulously clean, and Listerian or other precautions taken. The bearings are to be carefully taken, and then, by a narrow-bladed scalpel, a course is cleared down to the bone for saw or osteotome. (This incision is in the length of the bone.) If serious bleeding occur the wound may require enlargement, so that the vessel may be secured. The progress of the osteotome is to be carefully watched; one has heard of an excellent and trustworthy surgeon driving the cutting edge right through the limb, and even into the sand pillow on which it rested. The osteotome is introduced upon the flat of the knife blade; when the bone is reached the scalpel is withdrawn, and the osteotome turned and steadily placed upon the spot selected. "Do this lightly, so as not to damage the periosteum. Hold handle of osteotome firmly in left hand, with ulnar border of that hand against the skin of the limb. When two-thirds of the bone is divided the joint can usually be broken. Never use osteotome as a lever to break bone. When both limbs are

osteotomized, the first wound can be compressed by an antiseptic sponge and gauze bandage, while the other is being operated on. Use no drainage tube unless you expect danger of tension and suppuration.* If after the operation the toes become dusky, if blood or other discharge soak through the dressings, or if the temperature rise to 101°, the wound should be inspected. In a rickety child new cement cannot be trustworthy for several months; the operation can only improve the local, not the general condition. Retentive apparatus may be worn, and the child entirely kept off its feet for an indefinite time; little children should not be trusted on crutches.

Caution.—A word of caution in connection may not be out of place. Though the operation for gonu valgum is of comparatively recent introduction (Annandale and Ogston began the treatment in 1875, and 1876, respectively), cases are now reckoned by the hundred; and though the Listerian method, in one form or another, has made the operation a comparatively safe one, and has emboldened the surgeon, still it must not be lightly undertaken. In connection with his fatal case, Mr. Barker, a conscientious Listerian surgeon, wrote,† "I have never observed such scrupulous care as in this operation;" and in conclusion he states that the operation is dangerous. Doubtless fatal cases occur more frequently than they are reported: for instance, I lost a miserable child the other day, on whom I had performed epimandylar osteotomy from the outer side; and occasionally one hears of other mishaps. Death took place within forty-eight hours, probably either from fatty embolus or leptæmia. Dr. Chaffer, who made the post-mortem examination, could find, however, no clear cause of death. Recurrent hæmorrhage

* Keastley, "*Tales of Surgery*," p. 796. 1884.

† *Transactions, Clinical Society*, 1878.

from the anatomical snuff-box, or some articular branch, or even from the popliteal artery itself, may cause anxiety and involve suppuration, or even death. Suppuration may demand incision and drainage, and may be associated with pyæmia or septicæm. Lastly, the operation may give but partial improvement, relapse may quickly follow, or the joint (especially after section of the os stylo) may be left stiff.

Bow-leg is a simple curvature of the tibia and fibula; there is no bending of the femur, and the knees may be brought close together. When bow-leg is associated with curved femur, the knees are widely separated, and the condition is called *genu extensum*. Bow-leg may often be observed before even the child's feet have been put to the ground, in which case the curve taken is generally an exaggeration of the natural bend of the tibia. Frequently the deformity is the direct result of that peculiar habit, which the rickety child possesses, of folding its legs across each other, and sitting upon them tailor-wise. Such deformity is probably in error ascribed to the effect of muscular contraction; if this were the case, other long bones, such as the humerus, would be found bent. In severe cases one may find the humerus bent inwards just below the insertion of the deltoid, but this is from the soft bones yielding to the weight of the fore-arm and hand when the limb is raised. The radius and ulna may be bent from the child crawling.

The treatment should be begun as soon as the existence of the deformity is recognised. If the child be badly nourished or rickety he should be treated with special care (page 53). For the keeping up of an even circulation in the legs, warm stockings and woollen gaiters are advisable; for if, when the child is being carried or wheeled out in the open air, the legs become chilled, the nutrition of the bones suffers. Friction in the direction of the vessels and lymphatic

return should be employed morning and evening, after the warm bath; and if the patient be flabby, weakly, or ill-nourished, not only the legs, but the entire body may be rubbed over with cod liver oil.

Bathing the legs in cold water is not advisable, except in the warmest weather, and not even then, unless the circulation be found sufficiently weak to set the skin in a glow directly afterwards. Warm sea-water, natural or artificial, will be a useful



Figs. II and II'.—Simple Treatment of Bow-legs.

stimulant; but parents must be disabused of the widespread belief, that allowing the weakly child to amuse itself, with naked feet, on the seashore, is necessarily conducive to improvement. A large proportion of children with bent legs have been brought up on the bottle, and many of them on condensed milk or a farinaceous diet. Fresh milk, eggs, and meat will be wanted, but no tea, beer, or wine. If the treatment thus briefly sketched can be adopted, and the child be taken entirely off his feet, a steady improvement will set in; but if the deformity be already considerable it will be well to adopt

certain necessary measures. Thus, a light wooden splint, padded on each side, may be fixed between the limbs, and the legs bandaged to it. The splint should be long enough to reach some inches below the level of the feet, so that the child may find himself unable to stand, for it is absolutely necessary that no weight be transmitted through the leg bones (Fig. 12). To apply splints of wood or iron, and then allow the child to walk, is erroneous. Children do not feet when they are made clearly to understand that they must be kept off their feet, nor does health suffer from the enforced rest. The child should be taken out of doors as much as possible; the spinal column is probably as weak as the leg bones, so the less he is sitting up the better. If only one leg be bowed, it should be secured to a long inside splint, so as to ensure rest (Fig. 11). An improved condition of the bones is brought about more by the rest, and the adoption of general measures, than by the mechanical effect of bandaging. The author had under treatment a little girl with marked bowing of each leg; one leg he treated by forcible straightening under chloroform, the other he left alone. The child was taken entirely off her feet, and at the end of a year the bowiness had almost entirely disappeared from each leg. The rest necessarily obtained by the leg which had been forcibly straightened, had brought about an equal improvement in the other. With supervision, the deformity is sure to diminish with the growth of the child, but frequent manipulation and even forcible straightening may be found of service. When force is being employed, care must be taken to grasp the limb so that the epiphyseal cartilages do not run the risk of being detached.

Antero-posterior, and other irregular bendings, are often found in the rickety tibia. They may be treated on the principles described above; but if extreme, and the child's bones be solidly grown, osteotomy may

be needed. In the soft-bodied child forcible straightening may be resorted to. In a case recently under treatment, each femur and each tibia were readily fractured by the hands, and with great improvement. Osteotomy for bent tibia should not be undertaken without due deliberation. I have seen pyæmia and death follow the operation, when performed by a careful surgeon, with all Listerian precautions. But such cases are not generally reported, and as the operation of osteotomy has been allowed to obtain a character for simplicity and safety which is not warranted by facts. In some cases a linear section of the tibia may suffice; in others a wedge-shaped piece of bone must be removed. This latter operation must be done by a chisel, not by an osteotome. The operation is not a simple one in every case, for even in young subjects the bone may be of extreme hardness. For fuller information on these matters reference should be made to MacEwen's book.

Genu extorsum, out-knee, is the common form of bowy leg, the thigh bone and the leg bone being bowed outwards, so that the knees are widely separated. The condition is frequently met with in heavy, rachitic children, in whom the bones happen to be more inclined to yield than are the ligaments. When the ligaments are the first to give way, genu valgum results. On account of the strong support which is afforded to the outer side of the knee, by the ilio-tibial band, the external lateral ligaments are competent to resist any strain which they may be called upon to bear. In some cases of genu extorsum, the outward thrust of the knee is not associated with any alteration in the shape of the femoral condyles, as is the case in genu valgum. Marked elongation of the outer condyle corresponding to hypertrophy of the internal condyle in genu valgum, is of rare occurrence.

Treatment.—Many of the remarks made in

connection with the subject of *genu valgum* apply to *genu extensum*. But as the knee is displaced outwards, without being itself affected, it would be incorrect to bandage the limb to a long inside splint; for the effect of this would be to throw a violent strain upon the internal lateral ligament, which is in no way in fault. Should this be done, and the internal lateral ligament yield under the continued force, the production of *genu valgum* would be employed to correct the outward bowing, and the improvement obtained in the limb would be apparent, not real. In any attempt at forcible straightening of the limb, the integrity of this ligament must be respected. The gentle compression, and the employment of force, should be exerted upon the femur and upon the tibia, never at the joint. But though forcible straightening may be of value in the treatment of these limbs in early childhood, it is frequently superfluous, for with rest and treatment the young child will out-grow the deformity. The heavy mechanical supports supplied by the makers of apparatus are of little service, whilst to allow a child with soft bones to walk about in "irons" is a violation of sound principles. What is required is absolute rest. But when the bones are more solidly developed, as in approaching puberty, Macswen's operation upon the femur, with, perhaps, section of the tibia, may be demanded.

Weak knees.—A child, of four years, has recently been under treatment for a knee which had suddenly become valgus, after some supposal or real hurt. There was only the slightest amount of effusion in the joint, and pain was complained of only after exercise. The child was rachitic. The leg was much deflected outwards as the boy walked or stood. Most of the other joints were weak, and an abnormal amount of rocking was permitted at the other knee, even when fully extended. The limb was secured in a tussled

splint, the limbs being straight: instructions were given in massage, and rest was enjoined. Tonic medicines were prescribed.

RACHITIC DEFORMITY OF CHEST.

Pigeon-breast is produced in the rickety, or soft-boned child, by the bending inwards of the anterior extremities of the ribs. Thus the chest is compressed from side to side, whilst the antero-posterior measurement is increased. The condition is caused by the imperfect expansion of the chest during inspiration, and may be secondary to chronic enlargement of the tonsils, when those glands project sufficiently to cause dyspnoea. During the act of inspiration a partial vacuum is produced in the interior of the thorax. The atmospheric pressure, upon the outside of the chest, restores the balance by forcing inwards the pliant part of the thoracic wall, rather than by driving the full supply of air through the glottis. Alexander Shaw, who first suggested this theory, adduced an interesting clinical account bearing upon the subject.* A little boy suffered great difficulty in breathing, from enlarged tonsils; he was pigeon-breasted. A sudden attack of extreme dyspnoea demanded the performance of tracheotomy; a few days later the tonsils were excised, the chest filled itself with air during each inspiratory act, and the chest deformity completely vanished. Laryngismus stridulus also may cause the deformity; the spasmodic contraction of the glottis is often found in rickety children.

The general health must be improved by iron, cod-liver oil, quinine, and lime-water; the condition of the alimentary canal must be regulated, and enlarged tonsils, or other causes of the imperfect entrance of air, must be fully attended to. No tracheotomy or other instrumental procedure against the protrusion

* *Hillman's "System of Surgery,"* vol. v., p. 513. 1874.

steresis is required. Night and morning, and often in the course of the day, the hand of the nurse or mother should, by firm and gentle movements, help to correct the anterior bulging of the chest. Frequently the child should be made to take in several long sips of air. This exercise should be performed slowly and methodically. Exercise with light dumb-bells and "chest expanders" is desirable, as are also gymnastics generally, provided always that the strength and capabilities of the feeble child be not over-taxed. But even without any methodical treatment the pigeon-breast is apt to right itself as the child grows stronger.

CHAPTER VII.

ENLARGEMENT OF LYMPHATIC GLANDS.

ENLARGEMENT of lymphatic glands may be the result of local or constitutional causes. Usually it is determined by local irritation; and, in the case of a weakly or unhealthy child (scrofulous, let us say), a trifling irritation of the peripheral lymphatics may give rise to a disturbance in the gland associated with it, serious out of all proportion to the local lesion. The neck glands are those most often enlarged. They are numerous, and much exposed to cold; and they are associated with surfaces of skin and mucous membrane which are very prone to inflammation and ulceration. Particularly is this the case with glands in association with the ears, mouth, pharynx, and tonsil; when one of these areas is attacked the glands are quickly enlarged. Amongst the most common of the local causes of enlargement are the irritation due to the presence of pediculi, scalp warts, eczema, and impetigo, otitis, carious teeth, sore throat, and hypertrophied, inflamed,

or ulcerated tonsils. The absorption by the buccopharyngeal lining of the poisonous exhalations from closets, drains, or dust bins may cause the enlargement. And it is a positive fact that many a case of so-called scrofula (struma) would find explanation in the presence of chronic nasal catarrh, or of superficial eruptions of the bronch mucous membrane (Jacobi).

The chief constitutional causes are struma, and the weakness left after measles, or scarlet fever; but in the latter case, the enlargement may have been determined by the ulceration of the throat and tonsils; in the case of diphtheria, also, the swelling may be considered as of local rather than of constitutional origin.

Decayed teeth should be looked for, and the importance of such examination can hardly be over-estimated. Children may have such dread of being submitted to the dental surgeon, as to deny that a tooth has ever ached, but the admission of the fact should entail extraction. A carious spot in a tooth of the first set, if the glands of the neck of that side be enlarged, demands immediate extraction of the tooth, even though it have never ached. For irritation may be set up in the alveolar lymphatics sufficient to cause glandular enlargement and even abscess, although there may have been no pain or discomfort associated with the tooth. A child prone to glandular enlargement should not be allowed to run the risk of a lymphatic irritation, which may at any time be started by the presence of a tooth of questionable integrity. A tooth of the permanent set which may be irritating the peripheral lymphatics must be dealt with according to circumstances. It may be extremely inexpedient to temporise with a serious offender. If enlargement be due to the improper eruption of a tooth, the gum lancet may avert the complication.

The lymphatics of the elbow and arm-pit.—There is one gland at the elbow, just in front

of the internal intermuscular septum, which is often inflamed from injury or disease of the hand or forearm. A cluster of the axillary glands may be enlarged in lymphadenoma. Whenever one suspects serious disease of the lymphatics (page 108) the arm-pits should be explored. The best way to find enlargement is to pass the tips of the fingers to the very apex of the axilla, the arm being kept loosely to the side, and then, by slowly dragging the fingers down the side of the chest, to allow the glands gradually to slip up again between the fingers and the ribs. These glands are often implicated after vaccination, and especially if the child were unhealthy at the time of the operation. They would also become enlarged in vaccinia-syphilis.

The groin lymphatics.—If the enlargement be in the neighbourhood of the umbilicus opening, the child's trousers and sock should be taken off, and search made for sores about the toes, foot, leg, and thigh. Common causes of glandular trouble are chilblains, ingrowing toe-nail, the chafing of the heel by a badly-fitting boot, a scratch, a bruise on the knee, and the irritation of scabies. The more unhealthy the child the greater the risk of the secondary trouble being severe. Possibly the lesion, or abrasion, which started the enlargement, may have healed some time since, the child never having noticed it. With the on-coming of the fresh trouble in the groin, the initial lesion is very apt to be forgotten. A careful search may sometimes discover the pink sore of a sore which has recently healed. The child's word should not be taken as evidence of there having been no "sore place" upon the leg or foot previous to the occurrence of tubo. If the enlargement be along the line of Papez's ligament, careful inspection must be made of the buttock, perineum, scrotum, and penis, the prepuce being thoroughly retracted, and the membrane

beneath it examined. A healthy boy has lately been under treatment for buboes which were caused by a tight prepao; two of the inguinal glands were enlarged.

Strumous glands.—A chain of glands (*glandulae coarctatae*) extends along the entire length of the deep surface of the sternomastoid. Should one gland be enlarged from irritation, others may in time become involved, even though the primary source of irritation may long since have healed. Thus, it may be impossible to determine the exact cause of the enlargement; so one is tempted to suggest that in certain cases of struma the glandular enlargement is a primary affection. It is more likely that the child being strumous, a slight lymphatic lesion started the trouble. A common cause of enlargement is irritation of the pharyngeal mucous membrane by **sewer gas**. Though a healthy child might be the subject of enlarged glands from this cause, a strumous one is much more likely to suffer. In such circumstances the fauces might possibly be found congested, or inflamed; but all trace of irritation may have passed away before advice is sought for the "lumps." In every case the throat should be inspected.

On one occasion,* children from three different families, resident in a district where a sewer had been for some while emitting volumes of foul air, were under treatment for cervical abscess. In one of these families the children were markedly strumous, and had not the existence of the neighbouring sewer ventilation been known, one might have been inclined to have regarded the glandular enlargement as an independent manifestation of struma, no definite lesion about the pharynx or elsewhere being perceivable, discoverable. But the use of the word "struma" must not be made a scapegoat, in an endeavour to explain

* *Lancet*, Aug. 3, 1878.

the occurrence of glandular enlargements when no other source of irritation happens to be discoverable. A follicular abscess, which has long since healed, may have set up glandular enlargement throughout the whole neck of that child, whose lymphatic tissues have been already prepared for destructive disease by an inherited talent of strain, or by the effects of a prejudicial environment. One gland after another, along the chain, may be invaded by inflammation, and ultimately destroyed by suppuration, there being no room for doubt but that some morbid material had passed from one to another by a kind of filtration. In the case of strumous inflammation of the lymphatic glands, the whole course of the disease, from hyperæmia to abscess, may be run with little or no pain.

In certain cases of strumous enlargement of the cervical lymphatic glands, when the general measures recommended in this chapter have been submitted to a prolonged and unsuccessful trial, the surgeon may advise the adoption of more active measures. An operation for the removal of the glands may be not only justifiable, but expedient; but the risks from shock, hæmorrhage, septicæmia, and exhaustion must be duly considered. The glandular tumours may be but a local evidence of serious constitutional weakness; so there need be no hurry about the decision; and before operating, the various teeth, which might be a source of present or subsequent irritation, should be extracted. With judicious treatment, and especially under the influence of sea-breezes, enlargements may disappear, and old-standing sinuses cease to discharge.

Leeches, lotions, and counter-irritants to the skin over the gland are of little use in promoting absorption. In certain cases they may do harm by exciting the circulation, by determining the wreckage of a mass in which, but for this meddling, such disaster might not have supervened. Tincture of iodine, which

is often painted over the skin, is occasionally applied more for the sake of "doing something" than for any real belief in the therapeutic efficacy of the mixture. But iodine administered internally may be useful. Probably it is partly through the influence of the iodine in the air, that a stay at certain sea-side places effects so much. Bryant iodines the air of the sitting and bedroom of the patient, by putting some solid iodine in a perforated box, and placing it on a shelf.

The **injection of acetic acid** into the mass might be practised in certain cases, but rather than repeat the injection on the slight chance of causing a disappearance or diminution of the cellular elements, excision would be preferable. Repeated operations are to be avoided, as children are naturally intolerant of pain. Iodide of lead ointments may with advantage be rubbed over painless glands which have not melted in suppuration. It should be applied night and morning. Our forefathers held the compounds of lead in high esteem as "discolorants." It would be an interesting speculation as to what extent frictions night and morning might be concerned in the dissipation of the enlargement. One would be prepared to find that the judicious and persistent employment of massage might prove of considerable value.

Operative treatment.—Glandular abscesses should not be allowed to run their own tedious course, even though their gradual increase in size be not accompanied by pain or discomfort. Sometimes, when left to nature, the scar of the opening is fixed eventually small and insignificant, but more often the spontaneous evacuation is associated with prejudicial undermining, thinning of the integument, and extensive sloughing and ulceration. When pus has been definitely made out, it is useless to hope that it will be absorbed. The expectant policy is certain to be

followed by disappointment. The pus should be let out in one of the ways hereafter to be suggested. Only in rare instances are the fluid contents of the abscess absorbed, whilst the solid parts become converted into a cartilaginous mass. It is inexpedient to leave collections of matter in the cervical tissues; it is impossible to say where they may eventually find exit. The presence of the matter may excite irritation, and cause the formation of adhesions outside the abscess wall. These adhesions may melt away before the advancing pus, and discharge may at last take place into the posterior mediastinum, œsophagus, or even into one of the large veins of the neck. The differentiation of spinal abscess in the neck from that of chronic gland disease is found on page 243.

One should be loth to recommend the **excision of indolent enlargements**, because, as puberty approaches, there is a great probability of their quiet subsidence. But if the child's health be poor, and no improvement be effected; if the abscess be large, and few in number; if they be necrotic and increasing, rather than diminishing, and apparently disturbing the well-being of the patient; or if they threaten suppuration, they may be shelled out. Such a network of scar tissue as one occasionally sees after the spontaneous evacuation of glandular abscesses could not have occurred had operative measures been adopted. Treves* advises the earliest possible evacuation of pus. As soon as a collection is detected, however small it may be, it is to be let out. "Occasionally the inflammatory process in or about these glands is somewhat active; the skin is hot, and perhaps a little red, and yet there is no certain indication of the presence of any pus. In such cases, cold evaporating lotions are to be advised." Under their use the inflammation

* "Sarcoida and its Gland Diseases," page 182.

may subside, and occasionally suppurate, so far as one can tell, entirely warded off.

If it be a fact that a caseous lymphatic gland may be a centre from which infecting material may be conveyed to, and start inflammatory changes in, other glands in anatomical association, it is manifest that it should be removed forthwith. Fowler, of Brooklyn, goes so far as to advise * that when such occasion is within reach, the same rule that is applicable to carcinoma and sarcoma (namely, early and complete removal) should be practised. And that the rule might be of service in those doubtful cases where a persistent lymphadenitis, without causation, occurs, and no explanation for its existence can be found, as well as for large glands in the neighbourhood of caseous infiltrations. He also remarks, that what may appear, and, in the opinion of the old teachers, was, an innocent cheesy gland, contains a material which may rapidly propagate caseous lymphadenitis; that this caseous infiltration, in all probability, is either the bearer of, or the proper soil for, the germs of tubercle; that during a period of quiescence the patient is threatened with an outbreak of general tuberculosis. This may be but a speculation; but practice based upon it seems to lend it strong support. Ziegler speaks with much confidence of the dependency of tuberculous lymphadenitis on the presence of bacilli. "The tuberculous bacillus usually reaches the glands by way of the lymphatics; and as it sets up tuberculous disease at its point of entrance into the body, the affection of the glands is secondary." He remarks on the difficulty which frequently arises, of deciding whether a gland be tuberculous or not, and suggests that some of the so-called serofulous inflammations of the glands, in which no typical tubercles can be found, are really dependent on the invasion of tuberculous virus. Batlin says

* *Medical Times*, 14 Feb., 1885.

that a tuberculous gland is not only a cause of danger in itself, but a source whence new tubercles may be acquired. Whether the low inflammation be due to the presence of micro-organisms cannot at present be affirmed with certainty; but if eventually this be proved to be the case, the advisability of resorting to early evacuation of the gland capsule becomes obvious. It would often be impossible to say whether the glands were tubercular, or merely strumous.

Mr. Teale* teaches that "such degenerate structures, even when not suppurating, are centres from which health-damaging and death-dealing material may be diffused throughout the human frame." He also directs attention to the fact that the visible surface abscess, which would often be called a strumous suppurating gland, is merely a subcutaneous storage-reservoir of pus, and that its source, a degenerate gland, is not subcutaneous, but is situated beneath deep fascia, or even muscle. In these circumstances, the communication between the two places may be but a narrow opening, large enough to admit a probe only, and a close search may be needed for its discovery. Thus are to be explained many chronic sinuses and weeping sores, the unhealthy burrowings, and the open, indolent ulceration associated with strumous glands. A scraping operation may promote the rapid healing of such sores, and the mark left by prompt surgical interference in such a case is insignificant, compared with the scar which results when a sinus has been allowed to heal at its own slow leisure.

It is surely advantageous to convert an undermining and unhealthy sore, and a possible source of septic infection, into an open, clean, and granulating ulcer. If it be right to remove one degenerating gland, it must be right to remove every compromised gland (Teale). Thus, many operations at varying intervals

* "Clinical Lectures," *Medical Times*, 30 Jan., 1900.

of time, may be required. Often several gland capsules can be opened, and their contents wiped out, through the one skin wound. Sinuses may be dilated by drawing forceps. A drainage tube may be introduced into the deepest part of the wound, and kept in position for about a week. A mild lotion of carbolic acid may be used for the washings; the dressings will be of whatever antiseptic material the surgeon may prefer. When the drainage tube has done its work, it may be replaced by a slender ribbon of indiarubber tissue, so that the external wound may not heal before the deeper parts of the track have become obliterated. Wide pieces of stiff strapping around the neck will promote the healing, by exerting compression, by steadying the subcutaneous tissues from movement, and by ensuring rest for the platysma myoides. In some cases it may be expedient to obtain rest by the use of a collar (Fig. 37).

Yeale thus sums up his conclusions:

The guiding principle should be, that whenever septic material is contained in the system, it should be expelled, its burrows laid open, and disinfected. That in a very large number of instances of nonfatal neck there is no evidence of constitutional taint. The origin of the ailment being clear and defined, but drains in many instances, scarlet fever, mumps, etc. The cases often occur in families free from any tendency to constitutional disease. Perfect vigour may be restored after the destruction of all degenerate or septic material. The removal of the conformed glands is unlikely to be followed by further enlargement of glands, or by the need of repetition of operation. That interference is demanded when a sinus resulting from a degenerating lymphatic gland exists; when pus can be detected in connection with an enlarged lymphatic gland; when there are enlarged glands accessible to surgery in a patient in whom a

existence of a suppurating gland has been already discovered.

As to glands which, not having suppurated, nor having been proved to be cancerous in any one instance, are an cystic, or are accompanied by lowered health, the question of removal may be considered an open one. Probably in some instances the best method of treatment will be by *thermo-puncture*.

Paget also strongly advocates* the excision of strumous glands which have obstinately resisted other modes of treatment. In the excision of the kernel he uses the knife as little as possible; he strips off all ragged sheets of connective tissue, and swabs the wound with a zinc-chloride solution. Slender tubes, or horsehair, are used for drainage, and the finest silver wire for sutures. These last should not be left in for more than three days, lest permanent scars remain; they should be taken out earlier if the parts swell. Movements of neck must be restrained.

Thermo-puncture is a method of dealing with scrofulous glands which was introduced by Treves. A small needle, of Papelin's apparatus, is heated to a bright heat, thrust through the skin into the gland substance, and made to penetrate that tissue in three or four directions just as in treating subcutaneous morua. If movable, the gland must be steadied by the finger and thumb. If pus or bloody matter escapes, a poultice should be applied; but if not, the scar may be dressed with vasoline and eucalyptus.

Electrolysis.—The treatment of scrofulous glands by the electrolytic caustic, as described by Golling-Bird,† is far less suited for general adoption than is the method just described.

If an inflamed gland be rapidly increasing, so as to cause tension of sensory nerve filaments, pain is great

* *Indian Medical Journal*, June, 1894.

† *Lancet*, 1878.

and relief is demanded. It is advisable, also, to relieve the tension of the enlarged and acutely inflamed gland, even though no fluctuation can be discovered. In acutely inflamed tissue, where sensory filaments are in distress, puncture or incision will often be the means of affording escape for small quantities of thick pus where no actual suppuration had been discoverable. Though a child with acute abscess in the **mastoid gland** may be deprived by pain of sleep and appetite, he will become happy and quiet as soon as the tension is released.

To open a glandular abscess, chloroform should be administered. Time distress and apprehension are saved, and the surgeon can proceed more at his leisure, and effect the evacuation with greater thoroughness. The surface of the neck having been washed, a slender blade is thrust through the skin, and the interior of the mass reached by a director and ring dressing forceps. The opening is made in what will be, when the abscess has been evacuated, the lowest part. (The aspirator is little suited for the evacuation of gland abscess.) The cavity may then be scraped, and washed out with warm boracic acid solution, and a slip of gutta-percha tissue laid through the wound to prevent premature closure. The wound may be dressed with a fold of lint, wetted in boracic lotion, and covered with indiarubber tissue. Poulices would irritate the skin around the opening, and cause the appearance of vesicles or pustules. If a poultice be applied it should be small, and the adjacent skin should be kept thoroughly protected with a coating of vaseline. Simple incision of these abscesses must give way to the more successful one of scraping, washing, and drainage. An acute abscess will not need scraping, or other active interference, after being incised.

Scraping out the gland capsule is of value where a chronic sinus refuses to heal, when health suffers

from the discharge, or where strumous glands form an unyielding mass in neck, axilla, or groin.

The operation will be a prolonged one if the disease be at a considerable depth below the deep fascia. Chloroform having been administered, and the surface of the neck washed with an antiseptic lotion, a free incision is made down to the gland, or abscess obtained by a combination of dilatation and incision; or the capsule may be opened by the thermocautery. With Volkmann's spoon, the whole of the mass is thoroughly scraped out, and the cavity treated with iodoform or with carbolic lotion; a small drainage tube is passed into the depths of the cavity, and, if advisable, a fine suture or two inserted in the wound. Scott Hattams advises the removal of chronic scrofulous glands before they have reached the suppurating stage. He swabs the cavity with spirits of wine, and paints iodoform collodion over it.*

The fact of a child suffering from threatening phthisis need be no bar to the expediency of operation. Indeed, when the abscess cavity has become obliterated by healthy granulation, the child may the better be enabled to struggle against the pulmonary trouble.

Appreciation of operative measures.—If, in spite of the zealous adoption of approved general measures, the lymphatic glands continue to grow, or begin to soften, they should be enucleated. If they be allowed to soften, abscess is certain to follow, and continued suppuration to be followed by permanent disfigurement. Possibly the softening gland may be a centre from which infective material (tubercular) may be carried throughout the system (page 101). The scar left after enucleation (or scraping, in the case of abscess), will almost certainly be less conspicuous than that which would result if the abscess were allowed to run a natural course. The operation

* *Medical Times*, 21 Jan., 1883.

for the removal of enlarged glands may not meet with a ready acceptance at the hands of some of us, who have been brought up in an atmosphere of extreme conservatism in surgery; nevertheless, it must now be admitted to a definite position in the art. On the other hand, it is to be hoped that the reputation of a comparatively new operation, may not be allowed to suffer from indiscriminate adoption.

Prognosis.—Care having been taken as regards the diet and the surroundings of the subject of strumous glands, and cod-liver oil and iron being administered, there is every prospect of steady recovery, provided the affection be not excessive as regards the size of the tumours and the area of distribution. If any joint be affected, or if strumous ulceration exist on various parts of the body, the outlook is necessarily darker, as it is evident that the constitution is deeply implicated.

That perfect recovery is not rare, even after extensive implication of the glands, is evinced by the white or coloured network of slightly raised scars which cannot be hidden on the necks of many a grown person. The scar does not necessarily become less conspicuous with the growth of the child; it may even increase commensurately with other tissues.*

Simple lymphomata are tumours resulting from overgrowth of lymphatic glands, independently of local irritation and inflammation. The process is a slow one, the glands cluster, and sometimes fuse together; at first they are not adherent to neighbouring structures. They are most often seen in the neck, where they may form enormous, lobulated masses, along the whole length of the sterno-mastoid. Lying beneath that muscle, they cause it to be pushed aside, fattened, and thinned. They may be handled without pain ensuing, and they will be found so

* Holmes's "System of Surgery," vol. i, p. 204. 1853.

fully movable that, but for their number, they seem almost to invite the surgeon to shell them out. Fortunately, these lymphomatous tumours generally have a capsule from which they may be dislodged.

Operation.—There should be plenty of time and light at the disposal of the surgeon, for the operation is certain to be long and tedious. One of the chief points to be attended to is the prevention of hæmorrhage. The neck should be cleaned, and an incision made through the integuments. Every bleeding point should be secured, either by pressure forceps, or by a fine cat-gut ligature. There should be a plentiful supply of these ligatures close at hand, and after a gland has been partially encircled by the fingers, the vessels entering it should be ligatured before the knife completes the removal. If several glands be fused together, each slender pedicle should be tied in two places before the section is made between the ligatures, otherwise there may be needless loss of blood through collateral routes.

In **Hodgkin's disease** (soft lymphadenoma, lympho-sarcoma) the glands are enlarged in various parts of the body; they are smooth and movable, and vary in size from a pea to a hen's egg. Compared with lymphoma, it is a rare disease. At the onset, only one group may be affected; as, for instance, the glands of the neck. In due course those of the corresponding axilla, the groin, or the mesentery, are implicated. The kernels increase rapidly in size, so as to form large tumours, which are of a soft, brain-like consistence (Gowen). The lymphatic elements of the liver, spleen, and kidney are affected with a similar hyperplasia. The spleen may be enlarged to ten or twenty times its usual size. "In all important respects this disease resembles leucocythæmia, with the exception that the multiplication of white

oedema is wanting.[†] * It is not associated with tubercles. The child grows weaker, and eventually dies exhausted. The course of the disease is apparently unaltered by constitutional remedies, and the enlargement of the glands being but a local expression of a general dyscrasia, surgery can afford slight help. To recognise the existence of such a disease as leucocythæmia is to admit the advisability of avoiding active surgical interference in the early months of glandular enlargements generally. It would be a misfortune to attack the glandular oedema by operation, and then to find that the cervical enlargements were but the forerunning of serious constitutional malady. Exact differential diagnosis of simple from malignant lymphæmia is, in the early stage of the disease, impracticable.

Hard lymphadenoma (*lympho-sarcoma*) is allied to the soft variety of the disease; various groups of glands may be attacked in succession, and similar nodules may be developed in the lymphadenoid tissue of the alimentary canal. Transitional varieties between hard and soft lymphadenoma are described. For the **general treatment** of what may almost be called malignant disease of the lymphatic system, there is little to add to the remarks already made (page 98). *Liquor arsenicalis* in small doses (but increasing), repeated at short intervals, may have a prolonged trial. Fitcher describes † a case of malignant disease of the lymphatic glands in a boy of twelve and a half years; the child was weak and anæmic, the tonsils and larynx became altered, and tracheotomy was demanded in the fifth week of the disease. Death followed shortly afterwards. This case ran an unusually rapid course. The glandular enlargements were generally diffused and non-inflammatory.

* Wagner's "Manual of General Pathology."

† From the Medical Record, March, 1865, Johnson's death.

Picker suggests that the essential cause of malignant lymphoma is an infecting micro-organism.

Operation in malignant lymphoma may be required if the growth of the gland masses cause dyspnea, either from pressure against the side of larynx or trachea, or from pressure directly upon the front of it. The child will be liable to sudden and aggravated attacks of apnea, one of which may prove fatal. In such a case, tracheotomy is demanded. The operation may be long and difficult; it should be performed cautiously, and if it be found necessary to cut through a gland mass (supposing that it cannot be encircled), it may be well to use the thoraco-cantury for the purpose. An unusually long tracheotomy tube may be needed. If it be thought inexpedient to undertake a tracheotomy for the dyspnea, some temporary relief to pressure may be afforded by division of the deep cervical fascia.

The irritation caused by the presence of **pediculi capitis** is a common cause of enlargement, and even of suppuration of cervical glands. If the child be of an unhealthy nature, the suppuration may be extensive. One can often tell at a glance if the cervical adenopathy be caused by the irritation of pediculi. The child is generally pale and miserable, and has a peculiar dry look about the hair. Very often this dry hair has been carefully plastered down by the mother before the child is brought for advice, but the surgeon should discover a "dirtiness" of the scalp. It is advisable in every case of enlarged cervical glands to inspect the scalp; it were an insult to ask a mother if the head is "clean." The surgeon should exercise judicious tact in examining it; and it had better not transpire why he makes the inspection, lest offense be taken. My own method of proceeding is to take off attention by asking if there has ever been a sore place on the head, and then, without needing the answer, to make a thorough examination of the scalp.

If pediculi be there, they will most likely be found on carefully raising the lock hair behind the ear. On quietly showing a pediculus (but hardly else, for the ova attached to the hair do not always carry conviction), the mother generally feigns surprise, and willingly engages to carry out all instructions.

Treatment.—The hair must be cut quite short, or better still, the head may be shaved, for if short hair be left, adhering ova may cause further trouble. (The hair should be burnt.) The head should then be washed with soap and water, some places covered with simple ointment, and a skull cap tied on by strings beneath the chin. At once the glandular enlargement begins to subside, but oil and zinc may be required.

The obliteration of depressed cicatrices is the subject of an original essay by Wm. Adams; in which he recommends the subcutaneous division of deep adhesions of the cicatrix, by a fine tenotomy knife, or an *opthalmic blade*, which is introduced a little beyond the margin of the cicatrix and carried down to its base. The cicatrix is then carefully elevated, and kept in that position by passing a couple of fine hare-lip pins beneath it at right angles to each other. On the third day, when the pins are removed, the scar tissue, which is now infiltrated and swollen, may be allowed to find its level. It will probably remain for a while somewhat raised above the surrounding skin. If several punctures be required for the complete division of the adhesions, the tiny wounds may be used for the passage of the pins. If suppuration follow the operation, the wound may be treated with water dressing and oil-silk. But a child with an extensive or depressed scar is likely to be of a weakly nature, and little suited to undergo operative interference of any sort. It may be well to let such patients attain to puberty before advising operation, so that

constitutional vigour may be assured. There must be always a certain amount of risk attending the ultimate improvement of appearance, and of this the parents should be made thoroughly cognisant.

CHAPTER VIII.

TUMOURS.

THE tumours in childhood differ from those seen of later years. As Paget remarks,* medullary cancer is almost the only form of carcinoma met with before puberty. One does not meet with epithelioma or scirrhus. As might have been anticipated, growths upon the type of embryonic connective tissue (sarcoma) are common. Congenital sacral tumours (page 117), lymphoma, sarcoma, meningioma, and sebaceous cysts of the scalp need special descriptions.

For clinical purposes, it is necessary to arrange the tumours into two groups, *benign* and *malignant*; the latter comprises the sarcomas and the cancers. The features which these new growths have in common, and which constitute their malignancy are, briefly, these: They grow rapidly, and often invade the neighbouring tissues, so they become fixed to adjacent parts, and implicate the skin. They are often associated with ulceration, sloughing, and hæmorrhage; they cause deposits in the lymphatic glands associated with them, or, being circulated in the blood stream, their elements form secondary deposits in distant organs. After a time they cause the child to waste and become cachectic. They are apt to recur after removal. At the bedside it may not always be possible for the surgeon to affirm that a tumour is a cancer, or

* "Lectures on Surgical Pathology," p. 602. 2nd edit.



Fig. 1



that it is a sarcoma; what is necessary, however, is that he recognise its malignant nature.

SARCOMATA.

Sarcomata, like the embryonic tissues upon the type of which they are founded, are met with in several varieties. Their elements may be round, fusiform or giant cells. The round-celled sarcoma is the representative of the lowest form of development, but of the highest malignancy. The giant-celled, or myeloid, sarcoma is the representative of the medulla of embryonic bone; it is the least malignant form of sarcoma. The spindle-celled variety occupies an intermediate position, both as regards development and malignancy. Sarcomata differ from the fibrosarcomata in the type of which they are formed, in that they show no desire for the higher development. Were it otherwise, they might grow into fibrous tissue or muscle, and so become harmless elements in the parts which they infest. The cells lie in immediate contact with the thin-walled vessels of the tumour, and, readily entering the blood stream, they become quickly disseminated. They have a much less direct association with the lymphatic vessels. The sarcomata, therefore, differ from the cancers in the slowness with which they affect the lymphatic glands. Possibly, also, as suggested by Cohnheim, a sarcoma which does not appear congenitally may grow from some element of embryonic nature which did not possess the capacity for due development. As a rule, the sarcomata are painless, though if they be growing quickly, there may be discomfort from tenderness of sensory nerves. Sometimes the growths are hard, sometimes soft, but they are generally smooth and rounded; sometimes they are encapsuled.

The round-celled sarcoma corresponds in structure with granulation tissue, and the two growths cannot be differentiated microscopically. A tumour

formed of this material, and growing quickly, might appear to fluctuate. When such a tumour has made its way through the skin, a bleeding mass may sprout (*fungus hæmatodes*). From handling, or other slight violence, its vessels are apt to give way, and blood to be extravasated, or to form sanguineous cysts. The favourite seats of this sarcoma are the skin and subcutaneous tissue; bone, periosteum; brain, and retina (glioma); the testis and ovary, and the fibrous tissues generally, especially the intermuscular spaces.

The **spindle-celled sarcoma**, fibro-plastic, or recurrent fibroid tumour, takes origin from the periosteum, bone, fascia, and the fibrous tissues generally.

The **myeloid sarcoma** springs from osseous tissue and periosteum, especially that of the jaws, and from the articular ends of the long bones. It grows slowly, and on account of the great size of its elements (giant cells) it is less disseminated by the blood stream; when once a growth of this sort has been completely removed, recurrence is unlikely. The most frequent form is **epulis** (ἐπὶ ὑπὸν, *æter gum*). Sometimes it is necessary to extract one or more of the teeth, before a growth which is associated with the periodontal tissue can be entirely removed. The epulis is apt to be, especially in its deeper parts, osteo-sarcomatous. In a child, recently under treatment (Plate IV., Fig. 1), the epulis had grown quickly and extensively; for its complete removal it was necessary to take away the inferior maxilla, from the front of the alveolar process to considerably beyond the symphysis. This was accomplished by making an incision through the skin, along the basilar process, and down to the bone, and by clearing away attachments of muscle and mucous membrane with a strong raspatory.

On making an exploratory puncture the bleeding had been so furious that nothing short of section of the maxilla was deemed expedient. When a myeloid

sarcoma springs from the medulla, or cancellated tissue of a long bone, a strange expansion of the osseous tissue may take place, pulsation and "egg-shell crackling" being distinguishable.

The only **treatment** available is that by operation, and as with cancer, operative procedure must be thorough. The removal should be effected through healthy tissue, and at a considerable distance from the limit of the disease. That effort of the surgeon which may be considerable for its conservation in operations for injury or for innocent growths, must be condensed when the interference is for sarcoma or cancer.

Prognosis.—If surgical interference have long been delayed, the child may sooner fall a victim to deposits in lung, liver, or other viscera; and this is particularly the case with disease affecting the testis. In some children, death may be caused by the exhaustion attendant on ulceration, suppuration, or hemorrhage.

CARCINOMATA.

A **cancer** is composed of a lattice stroma, the alveoli being filled with cells of an epithelial type, and with "cancer juice." There is no single characteristic by which cancer cells may be recognised; they vary in size and shape, and that even in the same growth. Blood-vessels and lymphatics run in the stroma, but the vessels do not meander amongst the cells, as in the sarcomata. Lymphatics are in direct communication with the alveoli; thus, a cancer more quickly implicates the lymphatic glands than does a sarcoma; but its elements are less readily disseminated by the blood-vessels. Cancer is not so often met with in children as is sarcoma. Its most frequent seats are the kidney, ovary, and testis. The variety of carcinoma is the rapidly-growing encephaloma. The masses

is occupied with proliferation of cells, the amount of the fibrous element being inconsiderable.

Clinical features.—The tumour is soft, and may appear to fluctuate; it is rounded or lobulated, and free from pain. The grooved needle is sometimes required to complete the diagnosis from chronic abscess. Hatlin describes * a case of *carcinoma testis* in a child of two years. "Sections of the tumour presented a marked alveolar structure, so that I believed it to be a carcinoma." But he preferred, after all, to think that the growth was a "sarcoma imitating the structure of a carcinoma." He is of opinion that carcinoma of the testis does not occur in children. Sir James Paget, on the other hand, remarks that of twenty-five cases of carcinoma occurring before the age of ten years four were associated with the testis. In fifteen cases the cancer grew from eye or orbit.

CONGENITAL TUMOURS.

Congenital tumours may depend on developmental errors in normal tissues. Several varieties are described in a lecture† by J. Hatlin: (1) Included foetation; (2) disassociated blastoderm; (3) tissue hypertrophy.

1. **Included foetation; attached foetus** is the result of a fusion of two embryonic areas which have been accidentally turned in the blastodermic vesicle. The fusion, or attachment, may be so slight that the surgeon might be tempted to sever the connecting band, and so set two individuals free. Or "the condensation may be so complete that one of the germs may be surrounded by the advancing development of the other, and its growth compromised. A portion only of the parasitic foetus may attain full development, and amputation of various kinds may thus be produced.

* "Sarcoma and Carcinoma," p. 21.

† *Lancet*, 2 May, 1885.

Projection of one or more limbs of the parasite from the body of the host is an ordinary example of such a monstrosity.* The inclusion might be complete at the time of birth, the parasitic members sprouting later. The growing portion of the included parasite is particularly apt to be associated with the uterus, ovary, or testis; and the cystic formation may contain bone, hair, tooth, or other histological tissues, which, but for the situation, may be of more or less normal growth. The cause of the less complete development of the included foetal remains is most probably from the imperfect blood supply. Certain of these growths "may have been produced by some dislocation of the blastoderm of the subject, and not by foetal inclusion."†

Congenital hypertrophy, or atrophy, may affect an entire limb or part of a limb, or any individual organ or part of it. The error of development must be ascribed to some obscure disturbance of nutrition.

Congenital sacral and coccygeal tumours; false spina bifida.—Tumours about the sacral or coccygeal region may be connected with the interior of the spinal canal, or even with one of the pelvic viscera. They must be examined with care; digital exploration through the rectum may afford evidence of their complicated attachments. (See also page 283.)

Of a tumour in the middle line one must be particularly suspicious. Though it may be capable of some movement over the subjacent bone, it is almost certain to be rooted in the spinal canal. If we learn that it is associated with "weakness" of the lower extremities, there can be little doubt as to the importance of its connections. Though such a tumour may look like fleshy growth, it is likely to be the remains of spina bifida which has undergone spontaneous or artificial cure. Its base may be associated with some part of the crista sacra. Appended is a sketch of a

* For discussion, see Ziegler, *part. 6*, p. 77.

case in which, previous to our seeing the child, an unsuccessful attempt had been made to remove the growth (Fig. 13). (The tumour looked like a simple lipoma.) Our advice was that it be henceforth left alone. These tumours may be of the nature of cystic adenoma.

Treatment.—If operation be determined upon, a careful dissection should be made down to the base of the tumour, with all needful precautions against sepsis. If it be found unconnected with the



Fig. 11.—Congenital Sacral Tumour.

spinal canal, it should be removed by the knife. If connected by a slender pedicle, it might be ligatured and the tumour then be amputated; but if the communication with the interior of the canal were considerable, the wound should be closed and the tumour eventually

dealt with as in spina bifida. If a sacral tumour do not increase, it may be left alone. Most of these tumours shrivel up with advancing age, but some are of such enormous size as apparently to be incompatible with life; they may be sarcomatous in their nature, and some may possibly spring from Luschka's gland. The skin over the tumour may undergo ulceration, and facial exhaustion supervene.

Other varieties of tumour in the neighbourhood of the sacrum and coccyx are the **dermoid cysts**, which may contain hair, sebaceous matter, or rudimentary teeth. Also tumours consisting of fetal remains of bone or cartilage, or even of the vestiges of limbs. If a coccygeal tumour were found deeply connected with the interior of the pelvis, it had better be left

interfered with. The shock caused by removal, or attempted removal, would be serious, while the extent of the wound would entail a serious drain.

2. Dissociated blastoderm; dermoid cysts.

—In the process of evolution of the blastoderm of a single foetus, there may be an inclusion and separation from its proper connections, of some portion of one or other of the three layers, causing a congenital tumour. Some of these tumours are probably due to aberrant germinal ectodermic cells from the epiblast, which have wandered to an abnormal site, and there have, at a later stage, developed after their kind. Their contents belong to the skin and its appendages, and are well named dermoid cysts. They are most often found in the testis, ovary, orbit, neck, and on the head. Hardie describes such a tumour on the forehead; at birth it was as large as a marble, and seemed to have been taken for an encephalocoele; the cyst was eventually found to contain sebaceous matter and fine hairs.

Dermoid cysts of the ovary are of congenital origin, but at any time after puberty they may begin to grow. Sometimes their development may take place earlier. Thus, Mears has successfully removed a dermoid cyst by ovariectomy from a child of six years and eight months, and Spencer Wells has removed one in the same manner in a child eight years old (Schroeder). Other similar cases are recorded.

Cysts in the orbit may be recognised by their character of fluctuation *ie* doughiness; a grooved needle establishes the diagnosis and effects a cure.

3. Tissue hypertrophy.—Congenital tumours of this nature may be fibrous, cystic, or fatty, or of any combination of these varieties; they may be peduncled or sessile. The most important of them are next described.

CONGENITAL CYSTIC HYGROMA.

This variety of tumour is fairly common; it sometimes grows with alarming rapidity, and in this respect simulates malignant disease. It may cause death by exhaustion, or by pressure on important structures. In one child a hygroma at the root of the neck pushed aside all the movable structures; deglutition and respiration were thus impeded, and so great was the compression upon the large veins, that the eyelids, hands, and arms, became oedematous. Death was eventually caused by obstruction of the trachea.

The **favourite seats** of hygromata are the sublingual region (where it may be taken for ranula), the neck, and the axilla. The starting point is the stromal tissue; and when the growth is just beneath, or even slightly implicating, skin or mucous membrane, it may be taken for naevus. Probably it sometimes begins in the deep fascia, for it is associated with the skin above and the muscles beneath it; an innocent tumour situated upon the surface of or beneath the fascia would be unlikely to pass through it. Hygromata of the neck may extend around the carotid sheath, and even reach into the mouth and inspirate the trachea. Scarcely is it found upon the lower part of the trunk or upon an extremity. I have, however, seen a large hygroma upon the arm, and others upon the side, and upon the back. The first of these closely resembled a lipoma, but it was too freely incorporated with the skin to be of that nature. The one upon the side was dissected out with some trouble; that upon the back underwent spontaneous obliteration.

Pathology.—The growth is composed of a series of cysts, which are closely or irregularly spread through a diffuse bed of stromal tissue. The cysts are, in all probability, lymphatic spaces. Edematous and

others, in a silver-stained preparation, have demonstrated an endothelial lining continuous with, or exactly resembling, that of the lymphatic vessels. The spaces vary in size, and when distended they are spheroidal. Some of them may be as large as an orange, or even larger, whilst others in the same growth may be of the size of a marble or pea, or just visible to the naked eye. Several of the cysts may be in communication with each other. The periphery of the growth fades away into normal connective tissue. In removal by dissection, the cysts collapse; and when separated, the growth is seen as a ragged and insignificant mass of fibrous tissue, something like a piece of torn sponge, but with vacuolation indefinite. The larger and more solitary growths, when in the neck, may be described as a hydrocele. Sometimes they are of enormous size, and on their contents being drawn off, the cyst wall and the integument shrivel up into a pendulous and unsightly mass, which diminishes to insignificance as the child grows. When large and pendulous, the cyst may appear bluish through the thin and translucent integument.



Fig. 14. *Congenital Cystic Hygroma.*

The adjoining woodcut (Fig. 14) is taken from an infant with an hygroma of the right subclavian region; when she came under treatment the mass was growing rapidly. It seemed to be composed of six or eight large cysts. The tapping of one cyst did not procure the evacuation of the others; but, on the collapse of one, the others came into prominence and were emptied in turn. From each of the cysts first tapped

about an ounce of pale serum was withdrawn. After puncture the tumours entirely disappeared.

In another case the mother had noticed a swelling under the right side of the tongue, a few days after the birth. On its being shown to the doctor, it was called a "mucila." The swelling grew across the floor of the mouth, and amongst the tissues behind the symphysis of the maxilla, until a definite tumour appeared beneath the jaw. A guarded prognosis was given, and no treatment was suggested. The child was losing appetite and becoming thin. Had any one examined her then, for the first time, he might have experienced difficulty in excluding malignancy from his diagnosis. Later on, the tumour became walled into a solid mass, as if a large abscess were about to declare itself. The inflammation was associated with pain and constitutional disturbance, but on its subsidence, and without the concurrence of suppuration, the growth steadily diminished, and at last was represented by a mere fulness. An hygroma appeared upon the other side of the neck; it grew rapidly, but, like the other (with which it had no apparent connection), it underwent spontaneous inflammation and obliteration. The low vitality of these growths renders them specially liable to inflammation. (The diagnosis from *mucila* is completed on puncture.)

Treatment.—Like a nævus, an hygroma may cease to get larger, or it may even quietly disappear without apparent cause. Obliteration may be effected by an attack of spontaneous inflammation. It may, therefore, be advisable to delay active treatment, month by month, until at last interference may be unnecessary. With a tumour containing no evident cysts, the adoption of the Fodan policy has much to recommend it. Cysts may be tapped, one by one, or several of them may be dealt with on a single occasion. Often it is well to tap them at intervals,

as, in the meanwhile, the skin shrinks over the diminished mass, and thus the other cysts can be reached with more exactitude. For puncture an anæsthetic is scarcely wanted. Unless the cysts keep refilling, injection is not needed, and incision and drainage are superfluous. If injection be resorted to, and prove ineffectual, it may become expedient to set up an attack of inflammation in the mass by the introduction of silk setons. As soon as inflammation is started, the setons should be removed, and the mass poulticed. The inflammation may involve considerable shock, exhausting suppuration, convulsions, or even pyæmia; it should be resorted to only in extreme cases. The treatment is speculative, and its complications may prove unmanageable.

On one occasion there were two patients in the Louise Ward of the Children's Hospital, the subjects of multilocular hygroma. In each case the growth had extended from the root of the neck, beneath the clavicle, and into the axilla, till an enormous tumour occupied the jugular and pectoral region. In one case, an attack of inflammation came on spontaneously, in the other, Mr. Thomas Smith excited it by setons.

The attempt to remove an hygroma by dissection is apt to lead to serious and unlooked-for trouble. On all sides the growth is continuous with connective tissue. It penetrates to capsule; even the deep layer of the skin may be incorporated with it. Outgrowths may extend between muscles, nerves, and blood-vessels.

Sebaceous cysts are often met with in the regions of the orbit, forehead, and scalp; sometimes they attain considerable size. The probable mode of their origin has been alluded to on page 112. They differ from the sebaceous cysts of the adult, in that they are generally hard, and are deeply seated. They are not in the substance of the skin, they may be quite

beneath the occipito-frontalis: they are often in connection with the periosteum, or embedded even in the bone itself. The skin moves freely over the tumour, and sometimes the latter may move over the bone. They may retard the ossification of the subjacent skull wall, and to such an extent, that complete perforation may exist. They contain a cheesy, sebaceous matter, epidermal tissue, or thin serous fluid: fine hairs may grow in them. Paget describes a congenital sebaceous cyst, in a child of two-and-a-half years, which was situated within the layers of the dura mater, near the superior longitudinal sinus; it contained poorly epithelial cells and a lack of hair. A perforation in the occipital bone opened into a pit, which the cyst occupied, on the inner surface of the bone. "It is perhaps only during the vigour of the formative forces in foetal life that cysts thus organised and productive are formed."

Differential diagnosis.—When placed near the angle of the orbit, they must be distinguished from meningocoele (page 145). They are smaller and harder than a meningocoele, and of more definite outline. None of their contents can be squeezed back into the cranial cavity, and there is no increase with crying.

From **neuroes** they are distinguished by their hard and regular outline, the absence of discoloration of skin, and the unvarying size, the tumour neither increasing when the child cries, nor diminishing under pressure.

Treatment.—The tumour requires removal by scalpel and dissecting forceps. Mr. Holmes' advice, to make the skin wound in the line of the natural furrows of the skin, should be followed, with the view of keeping the slight resulting scar unobtrusive. The operation is not always easy. The incision should pass right into the substance of the tumour, the cyst wall being then extracted. Some of the cyst should be left

behind, lest healing be delayed, and the operation be forced but partially successful. If the cyst be embedded in the bone, the neighbouring dura mater must not be injured in the extraction. If the wound be somewhat extensive, it may be advisable to place between its edges a filiform roll of indiarubber tissue, for the purpose of drainage. The edges may be drawn together with cross-strapping, rather than with sutures. If redness or inflammation follow, it may be treated by water dressing, under oil-silk. Electrolysis and injection of ether are not expedient.

Fatty tumours.—A soft, lobulated, movable tumour, in the neighbourhood of thigh, buttock, or shoulder, is probably a lipoma. The differential diagnosis is chiefly from chronic abscess, sarcoma, and malignant disease. Any doubt as to the nature of the growth could be cleared up at the time of, or subsequent to, the ablation.

Fibromata may occur upon the skin, or in the connective tissue of any region. They are of a benign nature, and are little likely to be influenced by any treatment short of removal.

Enchondromata occur upon the metacarpal bones, the phalanges, and at the joint ends of the longer bones, especially the femur, tibia, and humerus. In these situations enchondroma is an innocent growth; when mixed with sarcomatous elements, as in the parietal region, the deposit is of a malignant nature.

Bone is naturally the seat of innocent enchondroma, but the outgrowth is not very common in childhood. It is firm and lobulated.

Treatment need not be precipitate, as the tumour may undergo calcification, and cease to grow. If it were in the way it might be scraped out from its root, or a phalanx might be removed in whole or in part.

Exostoses consist of calcified tissue, and are

often found at the articular ends of the long bones, especially below the head of the tibia.

They may arise from calcification of enchondromata; generally they are coated over with a thin layer of cartilage, by which their increase in size is produced. When this incrustation is calcified, the enchondroma ceases to grow. Their origin may at times be associated with a portion of unossified epiphyseal cartilage. Often they are pedunculated, and strongly hereditary; many may exist in the one subject.

Treatment.—They had better be left alone unless they are in the way. If necessary they may be removed by a small steel.

CHAPTER IX.

NÆVI.

Nævus is a dilatation of blood-vessels; an overgrowth of vascular tissue, capillary, arterial, or venous. It may be situated in or beneath the skin, mucous membrane, or meso-cutaneous tissue; a great number of nævi may exist in different parts of the child. Superficial nævi may be merely fat patches, as in "port-wine mark," without any thickening. They may be associated with much pigmentary staining; or with abnormal growth of hair (nævi pilosi). When upon the surface, and but thinly covered, they are apt to cause serious hæmorrhage.

The arteries supplying a venous nævus are generally small, though sometimes pulsation can be made out in them near the base of the tumour. The veins are dilated, and form blood sinuses, such as those found in ordinary erectile tissue. This expansion of the veins produces absorption of the fibrous tissue of the

nævus, so that the tumour may be temporarily flattened by compression. The manner in which nævi grow, cease to grow, become consolidated, or disappear without interference, is peculiar. "They are much more apt than the natural tissues are, to ulcerate after injury; and, in general disturbances of the health, they may perish altogether. Such events may be connected with the extreme slowness of the movement of the blood in the tumours." *

When beneath skin or mucous membrane, and not implicating the surface, the **diagnosis** may be uncertain; but sooner or later the superficial vessels are implicated, and the nature of the growth is clearly revealed. If the increase in size be rapid, the resemblance to malignant disease may become very close. A subcutaneous nævus is likely to feel knitted or spongy, the skin over it showing a bluish tint, from the presence of dilated vessels beneath. A nævus may remain quiescent for a long while after birth, and then assume active growth. When upon the face or head, it is apt to become turgid when the child cries; its ceasing to do so is suggestive of consolidation.

Capillary nævi may be flat or raised, or heaped up into a bright mass like a currant or strawberry. Sometimes the mother is apt to see in them a close resemblance to a mole or a lobster, and straightway endeavours to associate their causation with some fright or lagging which happened her during pregnancy. An inoffensive nævus which is out of sight, may be left without treatment; if it do not fade away, at any rate it will probably cease to grow. An unsightly nævus, or one which has begun to grow rapidly, demands treatment.

Delicate capillary nævi may be made to shrivel up by the single application of collodion; or by two or

* Paget: "Surgical Pathology," p. 558. 3rd edition.

three applications at intervals of a few days, the contraction of the colloidion causes such coagulation as to squeeze out the blood and prevent its subsequent return. If colloidion fail, ethylate of sodium may be applied. This sodium should rob the skin of the elements of water, and the caustic soda which is then left against the tissue quietly destroys it. The ethylate does not trespass upon healthy skin, and for small, superficial marks, its application often answers well; but it is not as certain in action as is nitric acid. It is of no special value in the surgery of naevi. If nitric acid be used, it can be conveniently applied on the end of a lucifer match or a fine glass brush. The healthy skin surrounding the naevus should be anointed with vasoline, as a protection against the spreading of the acid. Occasionally are seen hideous scars which have been caused by the careless application of the acid. In one case there was a central furrow extending down the cheek, from the scar of a naevus over the nasal bone, from the acid having trickled over healthy skin. The bottle containing the acid should be kept well out of harm's way. An infant, under treatment for naevus, kicked over a bottle, and had in consequence a slough of the scrotum. As the acid spreads farther than is intended, it is better to keep it from wetting the extreme margin of the patch to be destroyed; if the margin thus escape destruction, it can be touched subsequently.

A naevus over the anterior fontanelle (a favourite seat), on the eyelid, or inside the mouth, or rectum, cannot be conveniently treated in any of the ways just mentioned, but it may be effectually destroyed by electrolysis or by Paquelin's thermocautery. The hot point of the cautery must be directed horizontally, not vertically, over the fontanelle. The decomposition of the neovascularities by the continuous current is a satisfactory method of treatment, but if the mass be large

and deeply seated, electrolysis is apt to prove tedious. A convenient battery is a Weiss's zinc-platinum. The positive pole is connected with a wet sponge, placed upon the skin, while the needle, or needles, in connection with the negative pole, are introduced into the midst, and into the periphery, of the nœvoid tissue. A slight blackening or scorching of skin in contact with the needles, and a crackling of hydrogen disengaged within, are signs that all is going well. The sponge and the needles should be previously tested in a little water, to see that the combination of elements is in working order; decomposition of the water demonstrates efficiency. The needles should be made to penetrate every part of the tissue, which then becomes hardened from the coagulation; they should be gradually and slowly withdrawn, so that not a drop of blood is spilled. Thus the resulting scar is as small as it can be; the operation is prolonged and painful, and demands the administration of an anæsthetic.

If the growth be extensive or subcutaneous, it may be dealt with by the thermo-cautery. I lately removed by this means, at one operation, a large, deeply-seated nœvus, which involved the nipple and most of the mammary tissue of a female infant; the whole of the gland and the affected skin were removed, and the amount of bleeding was insignificant.

For *sympuncture*, the large blade of the thermo-cautery is made to penetrate the mass in every direction, one skin wound often sufficing for the purpose. At once it becomes hard, and soon begins to shrivel; the eschars are detached in due course, and a healthy, granulating surface remains. Water-dressing may be applied throughout the progress of the case. Subcutaneous nœvi are often circumscribed, and may be excised either by scalpel or cautery knife, without much bleeding. When the mass has been turned out, the bleeding vessels must be caught by the self-holding

forceps (Fig. 2). If the mass be removed by the scalpel, the incision should be made through unaffected skin; and the vascular tissue having been torn out, and bleeding points secured, the edges may be approximated by suture, a small drainage being inserted for the first day. The scalpel should be carried around the outside of the nevus. The treatment by **subcutaneous ligature** I have long since abandoned; it is a painful procedure, the effect is secured with sloughing and suppuration. Parts of the strangled mass are very apt to escape obliteration, and have to be attacked afresh, and much constitutional depression attends the discharge. Parents are naturally anxious that a single operation shall suffice for the obliteration. The old-fashioned complicated ligature, though still spread in text-books on Surgery, is now but rarely employed. The parts which escaped destruction by ligature seemed to grow with renewed vigour after the operation. Strangling the nevus by ligature around hare-lip pins, inserted at right angles to each other, through the base of the tumour, is not to be recommended.

Seeing how quickly small, speck-like naevi may grow into large and unsightly patches, it is advisable to treat every suspicious or threatening spot upon the face or neck before any progress can have been made. For this purpose there is nothing better than the fine point of the thermocautery, at a bright red heat. The pain is sustentatory, the destruction of the vessels certain, and the ultimate disfigurement slight.

Injection of perchloride of iron or other irritant, is untrustworthy. One has heard of a case in which the ala of the nose sloughed after a subcutaneous injection of tannin; again, a fatal result has followed the entrance of injected fluid, or of a loose coagulum, into the general circulation.

Vaccination as a means of removing naevi is

not to be recommended; it is a method of treatment more speculative than practical. Hideous scars may be caused by it, though the naevus may have escaped obliteration.

Pressure is a method of treatment occasionally employed with tumours, especially when the growth is situated over a surface against which compression may be kept up, as over a cranial bone. It may be exerted by means of a coin wrapped in a fold of lint, and secured by strapping, or by an elastic band which encircles the head, or takes its bearings from a closely fitting skull-cap. If the naevus be large, or if pulsating vessels be entering it, the treatment by pressure is almost certain to disappoint.

Harris illustrates his paper on congenital tumours* with a woodcut of the leg of an infant, which was almost entirely shrouded in a mass of hypertrophied vascular tissue, the circumference of the leg being nearly three times that of the other. The tumour was growing rapidly; the skin was so thin that the naevus threatened rupture. It was treated by occasional and moderate compression by a bandage of elastic webbing. On the second day hemorrhage occurred, which was arrested by the re-application of the bandage. After a few days the growth began to solidify, and in a fortnight was effaced.

When a large naevus is brought for treatment, no thought need be given to solis ethylate, vaccination, setons, or ligature, reliance being placed on the thermo-cautery or electrolysis. Concerning small naevi, anxious parents may be advised as follows: Except so far as a small naevus may happen to cause disfigurement, it is generally harmless, and interference may be indefinitely delayed, perhaps never required; it may fade away; and not a few naevi, by the pressure or chafing of the clothes, or without external irritation, undergo

* *Loc. cit.*

an attack of inflammation and effect their obliteration. A nevus must be watched, and its size compared from time to time with an outline drawing previously made; if it be found to spread, it can be attacked. If a nevus be pedunculated, it may be ligatured by a strong waxed thread. If it involve the whole thickness of the lip, it should be attacked from the dental aspect by igni-structure or electrolysis, so that no visible scar may result.

Arterial nevus are of rare occurrence. Several vessels may be detected, beneath the thin skin, running to supply the mass, and pulsation may be distinct and throbbing. In the mass itself, the arteries are elongated and coiled, the veins being insignificant.

Treatment.—They may be disintegrated by the blade of the thermocautery, but during the process sloughing hemorrhage may occur. As an extra precaution, hare-lip pins may be passed through the skin, and under the arterial trunks, and arranged with a twisted suture. The pins may be withdrawn after about twenty-four hours; but the child would require watching, in case of recurrent hemorrhage.

Lymphatic nevus is similar in its nature to that of the blood vascular tumors just considered. It may be observed at birth, or may take on growth subsequently. Should the network of dilated lymphatics infiltrate the skin of a limb, great hypertrophy may result. As affecting the lip (macrocheilia) and tongue (macroglossia) the disease is considered on pages 188 and 189.

Hairy mole.—A child has recently been under treatment whose left malar, infraorbital, and frontal region was deeply pigmented, and thickly covered with black hair. The appearance was as if a mole's skin, except that the hairs were long and black. There was also a thick growth of hair of that side of the head. With the hairy scalp itself no interference was

infestation, but the disfigurement of cheek and forehead was treated in repeated operations at considerable intervals with the thermo-cautery. With the red-hot blade five parallel lines were scored through the layers of the epidermis, and just into the true skin. The cauterization was still further increased by cross lines where the pigmentation and hair were blackest. The crops of hair which grew after operation became lighter and lighter, and the disfigurement faded in the most marked degree. There ensued no puckering of the skin, or retraction of eyelid. There is no reason why a small hairy mole should not be removed by the scalpel, if its presence cause disfigurement; but probably the better line of treatment will be with the use of the thermo-cautery. The treatment must, in any case, be effectual, and should never degenerate into mere irritation or excoriation. Moles may, later in life, become the starting point of malignant growths. Of this I have met with a characteristic example.

Port-wine stains of the skin might be dealt with in a manner similar to that detailed above, or they might be patiently treated by electrolysis. Often repeated puncture with the needles of the negative pole (page 127) could hardly fail to render the discoloration paler, even if it did not entirely efface it.

Warts, verrucae, may be solitary, or in clusters. Sometimes they are caused by local irritation, at others there is no apparent cause for them. They consist of enlarged, branched papillae, upon which epidermal scales are closely packed. They are homologous growths, and are to be distinguished from the rounded and moist elevations of constitutional syphilis, condylomata. These latter generally grow near a mucous membrane surface, but sometimes they are found about the thighs, elbows, or tongue (Plate III., Fig. 3). Warts may be treated by keeping them thickly covered with diluted red mercurial ointment, or by

glycerine which has been saturated with salicylic acid. If their removal in this way do not succeed, they may be touched with glacial acetic acid. A pedunculated wart may be made to slough by strapping its base with a waxed silk or thread.

Molluscum contagiosum, or *sebacous wart*, is a common affection. The tumours vary in size, from a minute speck to a pea; they may be still larger; often they are clustered. They are most frequently met with on the infant's face; and as tumours of an exactly similar nature may be found, at the same time, upon the breast or face of the mother, or on the face of some other member of the household, the contagionism of the disease would seem probable. A dark spot is generally to be seen in the centre of the growth. They are well shown in Plate IV., Fig. 2.

The **pathology** is unsettled. According to some, the tumour is the result of a distention of the sebaceous glands, with accumulated cells; others consider it to be an epidermal growth, starting in the hair follicles, or in the rete Malpighii. The tumours seem to be made up of nests of epidermal cells, in which lie characteristic bodies like swollen starch grains. These are either degenerate epidermal cells, or parasitic organisms (Ziegler).

The **treatment** consists in squeezing the little tumours between the thumb-nails; or they may be snipped off by a pair of fine scissors. It is unnecessary to touch with caustic the small wounds thus made, and it is not expedient to remove all the tumours on the one day if the child suffer much pain therefrom.

Boils, *furunculi*, are caused by acute inflammation attacking a limited portion of skin. Generally, the inflammation begins at a sebaceous gland, or a hair follicle; death quickly follows in the minute piece of tissue thus implicated. Eventually the small gangrenous shroud, "the core," is cast off. Until the boil breaks, or the inflammatory tension is relieved by puncture,

the child may suffer much, both locally and constitutionally. The usual seats for boils are the back of the neck, knee, buttock, the arm-pit, and eyelid. In the best-nursed situation the inflammation begins in connection with a sebaceous follicle, the disease being then called a **stye**. In some few cases boils may be the result of dirt, or other irritation; generally they may be taken as evidence of the child being out of health. The boy who is home from school, and eats, drinks, and sleeps more than he has been accustomed to do, and more than is good for him, is apt to break out in boils; so also is he whose diet is insufficient, and whose general tone is depressed.

Treatment.—A change of diet is likely to be beneficial; thus the over-fed subject should be supplied with less, and the poor-looking and underfed one put on a liberal diet of meat, with beer or wine. Iron and quinine tonics, or the laxative iron tonic, may be prescribed. Sulphide of calcium is of doubtful value, as also is yeast. A change of air may be found of great efficacy. The condition of the urine should be enquired into, and the bowels kept well open.

Local measures.—The severely inflamed and tense tumour may be relieved by puncture with a lancet, the wound being then dressed with a scrap of lint of the size of a sixpenny piece. This may be dipped in a weak solution of carbolic acid, and then covered over with a piece of oil silk of rather larger diameter. Fomenting is apt to set up irritation, and to determine the outbreak of crops of smaller boils. The adjoining tissue should be treated with vaseline, and all the parts should be kept free from pressure. Some boils diminish, and eventually disappear without ever "coming to a head," so that unless there be much tension the lancet need not be used.

CHAPTER X.

HYDROTHORAX AND EMPHYSEMA.

Hydrothorax.—As a result of inflammation, serous effusion may take place into the cavity of the pleura. It is only when the amount of effusion is excessive that surgical interference is called for. Then, the earlier the fluid is drawn off the greater the chance of the lung tissue completely recovering its function.

Signs.—When the pleura is full of fluid, the lung is expelled air and is compressed against the vertebral column. There is, therefore, a complete absence of breath sounds over the basal, anterior, and lateral regions of that side of the chest. The percussion note is absolutely dull; and when the hand is laid flat upon the ribs, and the child coughs, cries, or speaks, no vocal vibration can be detected, the sound waves being cut off by the intervening fluid. On listening between the scapulae, air may be heard entering the bronchial tubes. The heart may be considerably displaced, especially if the collection be upon the left side, the apex beating far from its normal situation, which is just below and to the inner side of the nipple. The side of the chest will look abnormally full, and the intercostal furrows may be effaced. That side of the chest does not move with the other, and as the one lung has to do the work of two, the respiration must needs be greatly quickened. The circulation is also embarrassed. The child will naturally lie upon the water-logged side.

Differential diagnosis.—The signs are not always as clearly marked as above recorded. From consolidation of the lung, the diagnosis will be made

by the history of the *side*, the presence of some vocal fremitus; and absence of increased fulness of that side of the chest, and persistence of the intercostal furrows in the latter disease, and by the character of the sputum. From malignant disease the diagnosis is not always easy. In some cases it can be effected only by exploratory puncture.

PARACENTESIS THORACIS.

The instrument used will be a fine cannula and trocar, or an aspirator; in either case the point of the instrument must be sharp, so that it is certain to pass through the thickened and tough parietal pleura. The instrument must be perfectly clean; and if the aspirator be employed, the operation had better be previously rehearsed with hot water, for the piston may be too tight, or require more "jacking;" taps may be stiff, or their working not perfectly understood, the needle may be stuck in the cannula, the india-rubber tube may be leaking, or some joint may not be air-tight. The complete aspirator of Dieulafoy may be used, but the stuyler one, which is extemporised out of an ordinary wine bottle, is quite as serviceable, and it is less likely to get out of order. Perritt* recommends a piece of india-rubber tubing, of $\frac{1}{8}$ in. bore, and long enough to reach from the patient's chest to the floor. The lower end is weighted with a piece of lead, so that it may remain beneath some carbolic solution in the vessel in which the fluid is to be received. The other end is secured to one of Dieulafoy's open cannulas, not less than three inches long. The trocar is made to enter the cannula by being thrust through the tubing close to the cannula. Each part of the apparatus is first cleaned with carbolic lotion. As soon as the trocar is withdrawn, the puncture in the wall of the tubing is obliterated, and the paracentesis is conducted with perfect antisepsis.

* Fothergill's *Prac. Essay*, 1863.

It is advisable that a cannula with a trocar be used, as the combined instrument is stronger than a simple hollow needle. Moreover, if the latter instrument be used, its sharp point must remain in the pleural cavity during the whole time of the operation, whereby the lung tissue itself may be damaged. The cannula should be a fine one, of about the size of a No. 1 (English) catheter. A fine one is less likely to do harm, and less likely to be blocked by lymph flakes, than the larger one. If a cannula without a trocar be used, its orifice may get blocked as it is entering the cavity.

As regards the admission of air during the operation, Percut righty suggests that though some authors may not regard the admission with disfavour, still, as no one has yet ventured to affirm that it is beneficial, the operator must give the patient the benefit of the doubt, and carefully exclude ordinary atmospheric air from the cavity. He is opposed to the use of Southey's trocars, as they have to remain a long while in the chest, and their presence is apt to be associated with the entrance of air. Unless the child be very opedemative, chloroform need not be administered. The skin may be rendered anæsthetic by the application of a small piece of ice which has been dipped in salt, and surrounded with a single layer of linen. No preliminary incision is needed, but if a slight one be desired, it should be made over the upper border of the rib, so that, as the needle is thrust inward, the intercostal artery may not be wounded. If no incision be made the trocar may be thrust boldly through the middle of the space.

The **site of puncture** should be in the fifth intercostal space, at about half way between spine and sternum. If it be made lower, there is a risk of the diaphragm obstructing the end of the tube. Some operators prefer, as their landmark, the inferior angle of the scapula, making the puncture just in front of

it. So long as the diaphragm is out of reach of the end of the needle, this spot serves well, but it offers no advantage which the other does not yield, as the pleural cavity will not be completely emptied by the one aspiration or puncture.

The child should be propped up in bed, brandy should be at hand, or ether, for insensuous injection, in case of faintness supervening. The skin having been blanchied by the ice and salt, the sharp instrument is to be thrust into the chest close over the upper border of the lower rib. It must be sent in with a short, sharp plunge. If the end of the index finger be fixed on the instrument, at about an inch and a half from the point, it is unlikely that the lung will be wounded. As the serum comes to flow, the tube is withdrawn; if a simple canula be used the end should first be blocked with the finger, so as to keep air out of the cavity; the entrance of germs might cause the remaining serum to become purulent. If the aspirator be used, the vacuum must not be very thorough, lest the expanding lung wound itself against the eye or the end of the tube. The lung may be sucked over the tube, then its surface capillaries are ruptured, and the escaping fluid is blood-stained. If a canula and trocar be used, the canula must be withdrawn just when the flow begins to get irregular.

Sometimes, even if no air have entered the cavity, suppuration will follow on the operation; rarely in childhood is the fluid found clear and limpid. Occasionally, after the tapping, the lung expands forthwith, the thoracic troubles entirely disappearing. In other cases the favourable result may follow after repeated punctures. If it be uncertain whether the fluid in the pleural cavity is serous or purulent, an exploratory puncture may be made with the fine needle of a hypodermic syringe. This may be resorted to without hesitation.

Often a simple hydrothorax becomes persistent without any apparent cause; the latter condition is known as *empyema*.

Fallacies.—Although the chest may contain much fluid, the aspirator is occasionally unable, even in childhood, to effect its withdrawal. This may be due to the fact that the lung is solidly compressed against the spinal column, and unable to expand; that the diaphragm fails to rise, or the chest walls to fall inwards; and in varying proportions all these conditions may obtain at the same time. The end of the needle may be manifestly free in a large collection of fluid, and the aspirator may be in perfect working order, yet little or no fluid escapes on setting the apparatus in train. To remedy this, Parber has suggested* that carbonised air be pumped into the upper part of the pleural cavity, to replace the fluid drawn off from the lower part. The suggestion is based on purely mechanical principles, and is likely to be of service.

A cough which is apt to occur as the fluid escapes, shows that the lung has not lost its power of re-expansion. This cough tears through adhesions, and is, therefore, beneficial "within reasonable limits." Excessive coughing may be checked by applying an elastic bandage round the lower part of the chest (Percut). Christie,† before operating, puts a broad bandage round the chest, which is laced behind like a corset. From time to time, during the aspiration, as coughing or dyspnoea supervenes, he tightens up the lacing with marked effect. By thus compressing the elastic ribs he makes the aspiration more than usually thorough; he is of opinion that by allowing the bandage to remain on for some days, the risk of re-accumulation of fluid is diminished.

Empyema.—A simple hydrothorax is very

* *British Medical Journal*, 1883.

† *Ibid.*, 1883.

likely to become purulent in time, and if, on making an exploratory puncture, it be found that the pleural cavity contains pus, surgical interference is demanded. Certain symptoms may possibly have already made the medical attendant suspicious of the nature of the fluid, such, for instance, as shiverings, or even convulsions, the elevation of temperature, and the increasing distress. As a tentative measure, aspiration may be adopted, for though the cavity cannot be completely emptied by this process, yet the removal of a certain amount of the fluid may be the means of promoting the rapid or gradual absorption of the rest. Sometimes even a single tapping suffices to establish convalescence. But if the area of disease extend again after the operation, a second or a third puncture may be tried. If these measures require to be made at short intervals, say of a day or two, the probability of a successful issue from this simple treatment is remote. If a child show but little or no real improvement after the tapping, continuance of that treatment must not be persisted in; but the pleural abscess (for such it is) must be treated on the principles which guide one in dealing with a collection of pus in any other cavity. Thus, free incision and drainage are demanded.

If the collection of pus be left uninterfered with it may **discharge itself spontaneously**, through an intercostal space, or a bronchial tube; or it may burst through the diaphragm and give rise to fatal peritonitis. Speaking of the spontaneous opening, West remarks that the pus is discharged almost invariably through the fourth or fifth interspace, and a little outside the nipple. Further on, also, in discussing the value of the operation of tapping, he says that he has in no single instance regretted its performance, but that he has often been sorry that he had not resorted to it sooner.

The layer of the pleura which is lacerated with pus behaves like the surface of an ordinary ulcer; it covers itself with a stratum of granulation tissue which may eventually be converted into fibrous tissue thickening the original pleural wall. Or, coming into contact with an apposed surface of the membrane, which is also granulating, the two layers may become joined by firm, fibrous adhesions.

The **site recommended** for the opening of the pleural abscess is the fifth intercostal space, at the junction of the anterior third with the posterior two-thirds.* Chloroform having been administered, an exploratory puncture at the selected spot is made with a fine trocar and canula, and a grooved director is passed along the track into the pleural cavity. Along the groove a probe-pointed bistoury is then thrust, and an incision about an inch in length is made through the space. This incision is subsequently enlarged by thrusting in the end of the finger, and working it along between the ribs. Through the wound, two large indiarubber tubes, fixed side by side, are introduced, and the cavity is thoroughly washed out with a warm solution of boric acid. Fingers, instruments, and tubes should be scrupulously clean. The supply tube is connected with an irrigator or a siphon, and one should be able to regulate the quantity of the fluid passing along it by the use of a small tap. The waste tube should bring the washing from the cavity into a basin placed beneath the bed; irrigations are to be performed twice daily. The withdrawal of the tubes is regulated by the nature and quantity of the fluid exuding, but it is better to leave them in a little longer than may be absolutely necessary rather than to run the risk of being compelled to re-insert them.

Careful attention must be paid to diet, and wine

* Dr. Salzer-Germelin and Morison; "*Revue Mensuelle des Maladies de l'Enfance*," April, 1884.

should be liberally administered. If necessary, extra food may be introduced into the stomach by the oesophageal tube (page 43). The drugs required will be quinine and iron, and, perhaps, small doses of opium. The free entrance of air into the pleural cavity is advantageous, in that it affords support to the lung tissue, and thus shields it from consecutive engorgement. The thorough antiseptic irrigation and the free drainage prevent decomposition and ensure the regular and prompt discharge of fluids.

The **dressings** should consist of bulky pads of carbolic tow, sewn up in gauze bags. They may be kept in position by a wide strip of linen which is long enough to meet round the front of the chest, there to be fastened by a few safety-pins. If the discharge be offensive, finely-powdered iodoform may be dusted over the pads. By such method of procedure many advantages are secured: the preliminary puncture with the hypodermic needle has made the diagnosis sure, and has appressed the site of puncture. (Should old adhesions have confined the pus in two or more separate compartments, each would require puncture, but the preliminary exploration would have afforded security against the possible risk of plunging the aspirator needle into the substance of an adhesion, and into adjoining lung.) The selection of the fifth space precludes the risk of wounding the diaphragm or liver; and being towards the front of the chest, the wound is conveniently situated for the washings; the question is not one of single drainage, or the opening would have been made far back. As the opening is single, there is no risk of wounding the lung, as might arise in a probing for the site of a counter-opening. After a short time, the washings need not be done so often as twice a day, and the nurse herself may be entrusted with their execution.

The scalpel should be used only for dividing

the structures down to the depth of the intercostal spaces, the wound being carried further inwards by employment of director and dressing forceps, after the manner of Hilton. The full and even flow from the irrigator contrasts favourably with that obtained by the use of a syringe. The large size of the tubes ensures the free entrance and exit of the fluid. The boric acid lotion is preferable to that of carbolic acid on account of the readiness with which children are influenced by the toxic effects of the carbolic solution, especially when a large absorbing surface is concerned; whilst irritation of the skin by the carbolic acid solution is also avoided. Carbolic gauze, however thickly applied, is apt quickly to become saturated, and to demand renewal, and the gas may be found coming out between the dressing and the skin. The chilling effect of the spray might be prejudicial; and, from various reasons, the spray-and-gauze treatment can rarely be adapted in a private house with complete confidence and satisfaction, unless the practitioner is in constant attendance, or the nurse is competent to remove the dressing as often as may be necessary. However, in five out of the six cases of empyema in children (treated by Forreitt with spray and gauze in hospital) the results were extremely satisfactory. The chest wall was incised through the middle of the seventh or eighth space; two drainage tubes were introduced side by side, one of which was removed on about the third day.

Care must be taken that the drainage tubes are securely attached, as they are very apt to get adrift into the interior of the thorax. Parker has an ingenious plan of fixing them (Fig. 15). He takes a piece of thick indiarubber tubing (without lateral perforations), of about the circumference of a cedar pencil; in the middle of this he makes a longitudinal slit of about three quarters of an inch. Through

the slit run the afferent and efferent drainage tubes, which are thus securely grasped. But to make the grip safe, he twists a piece of fine metal wire several times around between them, so that each is held in a separate grip. The ends of the tubes he then rolls inside out for about a quarter of an inch, so that they may be kept wide open; and as the collars thus made lie against the outer side of the tube any slipping is absolutely impossible. For irrigation a connection is easily made between these tubes and the others which bring the fluid into the chest and take it away again.

Tube loose in chest.

—Occasionally one is called to extract a tube from the pleural cavity. On slightly enlarging the wound, wedging the ribs aside (perhaps with hæmorrhagic forceps), and searching the cavity with the finger, the tube may generally be found, and extracted with forceps. A speculative search with forceps alone is apt to be unsuccessful, but it may be cautiously tried before more energetic means are resorted to. A flushing of the cavity with a warm, antiseptic solution might be the means of bringing the tube to the opening. Neither probe nor forceps can recognise by the touch an indiarubber tube.

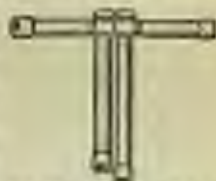


Fig. 15.—*Drainage Tubes for Empyema.*

Resection of portions of the ribs has been adopted in the after-treatment of certain cases, when the lung has remained collapsed and bound to the spine, and when chronic pleural discharge failed to diminish. The operation is resorted to in order that the rigid chest wall may fall in and obliterate the pleural cavity; but it should not be undertaken as a primary measure, or merely to ensure a more perfect drainage. In young children, a natural obliteration

of the cavity must daily take place, certainly though sometimes slowly, by the falling in of the chest wall, the influence of a certain amount of lateral curvature, the elevation of the diaphragm, and the expansion of the opposite lung.

CHAPTER XI.

BURNS AND SCALDS.

BURNS and scalds are serious injuries in childhood; they may cause death by shock, exhaustion, tetanus, lung disease, or blood poisoning. In rare cases, fatal hemorrhage may occur from secondary ulceration implicating a pancreaticoduodenal artery. The commonest cause of death is shock.

Prognosis is most unfavourable when the burn is about the pelvis, abdomen, or thorax; this may be on account of the close proximity of extensive plexuses of the sympathetic system. When as much as one-third of the surface of the body has been burnt, recovery is highly improbable; pneumonia may thus depend upon the extent of skin injured as well as on the depth to which the destructive action has extended. Children are sometimes severely scalded from being incautiously plunged into a hot bath when seized with convulsions, from the application of over-hot positives, and from the spitting of a teapot. Extensive injury and shock have followed on a child being made to sit over a chamber-vessel containing hot water for the relief of chronic constipation; such a case is at the present time under my charge, with extensive ulceration of each buttock. The child is kept lying prone.

Treatment.—If a child's clothes were soiled, and he have been wrapped in table-cloth, coat, or rug, he had better not be disturbed until clove-form has been

administered. The anæsthetic allays fright, and diminishes shock. The clothes should then be cautiously removed, and each burned and scalded part dressed; and after this, the fear that the pain is disturbed the better. To diminish the effects of shock, hot bottles wrapped in flannel may be tucked in the bed, and warm drinks given. No one should be allowed at the bed-side but the nurse on duty, for quiet is of great importance.

Wine should be given at short intervals, with milk or egg, and morphia should be administered in small repeated doses. Bismuth of potassium will be indicated if convulsions supervene, but even then calomel may be placed rather in the morphia; turpentine oil may be required. The intense thirst may be partially allayed by the sucking of small pieces of ice, and by draughts of soda-water and fresh lemon juice, with sugar and ice. Children are especially fond of fresh fruit when they are febrile, and it is generally good for them.

Local treatment.—Each dressing should be carried out so as to cause the least pain and apprehension. Carbolic acid solution (one in forty) is a valuable application, as the drug keeps the wound aseptic, and deadens the sensibility of the nerves. Lint soaked in it may be applied under oil-silk, so that evaporation cannot take place, nor the dressings become dry and adherent. Additional quantities of the lotion can be introduced by a small syringe, but watch would have to be kept against carbolic acid poisoning (page 435).

Lint thickly spread with vasoline and eucalyptus may be laid on a scorched surface, and over this a padding of cotton-wool bandaged. To check foul discharges, iodoform may be mixed with the vasoline. B. W. Richardson* recommends the application of a mixture

* "Antisepsis," April, 1891, p. 354.

of dry powdered ice and lard, put in a thin canvas bag, and laid on a recently scalded surface; a fresh bag being applied on the occasion of pain returning. This was also Sir J. Earle's method of treatment.

If the burn be deep, the dressings require more frequent changing. Rags wrung out in camellias oil and water, or solution of benzoic acid, may be applied under oil-silk. If the child be in pain, chloroform may be administered for the first few dressings. I have not experienced much benefit from the use of saturated solutions of carbonate of soda. Carven oil is not so satisfactory an application as those mentioned above. Bead, of Leicester, speaks highly of an ointment made by dissolving eighteen grains of powdered benzoic acid in a drachm of hot glycerine, and added to an ounce of olive oil; and Walton Brown extols a lotion of chloride of potash, of five grains to the ounce of water, applied under oil-silk.

Dusting the denuded surface with flour from a kitchen dredge forms a thin protective cake over the exposed nerve filaments, and shields them from the air. As serum oozes up, or detaches the crusts, fresh flour may be dusted. Air is a great irritant; a burnt surface should be exposed to it as little as possible; at the dressing, one part should be covered up before another wrapping is undone. An excellent dressing to foul sores is carbolic tow, made into flat pads, and stitched up in gauze.

If a limb be deeply charred, it may be expedient to amputate it forthwith, as the process of ulceration and separation is tedious, and the child is apt to sink from the exhaustion which it entails, or from the effects of a broncho-pneumonia, which is probably pyæmic in its nature. Congestion of the brain and its membranes is associated with excitability and succeeding coma; erysipelas and traumatic fever may supervene; indeed, the latter condition

must be anticipated, and combated with stimulants and opium. The erysipelas may be treated by common white lead paint, or by covering the surface with the liniment of lactate of lead. Blisters may be pricked, but the epidermis should not be removed. Shiverings may be the result of the direct injury to the nervous system, or they may be of pyæmic origin.

Deformities follow on the healing of extensive burns. It is often said that the cicatrix after a burn contracts more than any other kind of scar; probably the true explanation is that this cicatrix is usually more extensive than that left after any other injury, the contraction being proportionately great. The elements of the scar tissue cannot be influenced by antecedent conditions. The contraction of a scar at the front of the neck may drag the inferior maxilla down to the chest, and prevent its proper development; the lip is effaced, the teeth come through irregularly, and the saliva constantly dribbles away. Attempts to improve the disfigurement is likely to be disappointing, as neighbouring skin is apt to be unsound and intolerant of interference. All that can be contemplated will probably be an operation for supplying a lip out of the healthy tissues of the cheeks. If the burn be at the back of the knee the leg must be kept extended by a stirrup and weight (page 415), provided that the tissues above the ankle be sound enough for the attachment of strapping.

If the burn be limited to the front of the knee, the leg might be kept flexed, so that when the scar is contracted to the utmost, full flexion may be still permitted. If the burn be in the groin, the child may be placed upon a Thomas's hip splint. If at the front of the elbow, the limb will be kept extended; whilst if on the salient angle, the fore-arm had better be flexed. Like principles would guide one in dealing with a burn about the shoulder, arm-pit,

wrist, or finger. If the opposed surfaces of the fingers or toes be granulating, they must be preserved from mutual contact by strips of lint, smeared with vaseline and eucalyptus, or some such dressing. If the nose be bent, a short piece of drainage tube should be fixed in the nose during the cicatrization. But when an arm is bent to the side by cicatricial bands, or an elbow or other joint is permanently flexed, plastic operation may afford some improvement, but subsequent contraction of the new scar tissue is certain to follow. The tissues in the neighbourhood of a cicatrix are rarely available for plastic operations, whilst flaps transplanted from distant parts often fail to take root in the scar tissue prepared for their reception. The result of interference with contracted cicatrices is generally disappointing, even when the after-treatment bestowed upon the case has been patient and prolonged. Fingers or toes which are curled round may require amputation. During the healing process the part must be arranged upon a splint. An arm or leg which is greatly deformed, seriously in the way, or covered by an extensive and intractable ulceration, may demand amputation. The mere division of a contracting band avails nothing unless the improved position be perseveringly maintained during the subsequent granulation. Constant exercises of the limb, however, with gentle frictions and stampings of the tender tissue, will ensure the greatest amount of suppleness for the scar; but care must always be taken lest the friable scar tissue give way, and an intractable ulceration follow. The healing of healthy ulcers may be accelerated by skin grafting; for this purpose minute chips of healthy skin which has just been removed at a circumcision may be made available (Lance).

CHAPTER XII.

INFANTILE PARALYSIS—PSEUDO-HYPERTROPHIC PARALYSIS—TETANY—SPASTIC PARALYSIS—NEUROMIMESIS.

In the early days of **infantile paralysis** the diagnosis may be obscure; the surgeon may be called in to give assurance that the suddenly helpless condition of a limb is not the result of some recent and severe injury. In the later stages of the disease, when paralysis has been followed by deformity, the case may be considered as purely surgical. The early diagnosis of the disease is often overlooked.

Pathology.—The nerves which govern the nutrition, and regulate the secretions of the muscles, of the extremities, are associated with large, multi-polar cells in the anterior horn of the grey matter of the spinal cord. (Anterior poliomyelitis; *anterior*, "grey;" *posterior*, "marrow.") When acute inflammation attacks this grey tissue, the function of its vascular elements is interfered with; and if a considerable extent of the grey column be implicated, many muscles are thrown out of working order. Should extravasations of blood take place, the destruction of the cells, and of the delicate fibres associated with them, may be irremediable. Mowry prepared an extremely interesting microscopic preparation of the spinal cord of a child, who died of leucæmia-præcox shortly after being attacked with infantile paralysis. The sections demonstrated distension and thrombosis of vessels, especially in the anterior cornu, an abundant infiltration of leucocytes, and a general absence of nerve cells.*

* Transactions of the Pathological Society of London for 1884.

Clinical history.—The paralysis may come on without warning, or it may be preceded by a short febrile attack, or convulsions; it may be accompanied with pains and tenderness in the limbs.* Sometimes the attack is associated with vomiting. If, as often happens, the child be cutting a tooth at the time, the premonitory symptoms may be attributed to "den-tition." If, unfortunately, the nature of the illness be not recognised, the medical attendant may find himself blamed when, later on, as the child begins to crawl about again, paralysis is discovered. Such blame is unreasonable; but the practitioner who is prepared to read the warnings of paralysis is least likely to be surprised. As a rule, more muscles are at first affected than are ultimately left paralysed. This is due to the disturbance of certain outlying cells by hæmorrhage or by inflammatory exudation being only temporary. In one case, all four extremities were paralysed; gradually the arms recovered, but both thighs and legs have remained useless, in spite of treatment. When only one group of muscles in a limb is left paralysed, deformity is produced; thus, on the lateral muscles being atrophied, spurious talipes valgus may ensue. (See page 431.)

Groups of muscles in a limb may be paralysed, whilst others may be but partially affected, or entirely escape. Favourite groups for permanent paralysis are those of the extensors of the toes and flexors of the ankle. In no case is sensation diminished; sometimes, indeed, it is exalted. Infantile paralysis affects the lower extremity more often than the upper, though a "wasted arm" or deltoid is of no infrequent occurrence. Atrophy quickly supervenes, not simply from want of exercise, but from damage to the nerves which govern nutrition. The flabby, wasted muscle no

* "Muscular Atrophy," by Allen Sturge; Proc. of Med. Soc. Lond., vol. v.

longer responds to the interrupted current, though imperfect movements may be excited by galvanism.

Prognosis.—Fortunately, permanent paralysis is rarely so extensive or complete as it threatens to be at the onset of the attack; after the explosion in the grey matter, the alarm is often great, and the appearances serious; the case is, however, almost sure to improve to a certain extent. I have lately had under supervision a child whose left upper extremity suddenly became painful and motionless; after a few days the muscles gradually regained power, and at the beginning of the second week the effects of the attack had completely passed away. Generally, however, some one or more muscles will be left enfeebled or useless. In the case just cited a temporary relapse occurred in the arm muscles some weeks after apparently complete recovery from the attack of paralysis. As regards the prospect of ultimate restoration, valuable information may be obtained by the use of the continuous or interrupted current. If, under stimulus, the contraction can be excited, even though the atrophy be extreme, recovery may be looked for. As the muscle improves it answers less to the continuous, and more to the interrupted current.*

The **differential diagnosis** is not always easy, and in the earliest hours, or days, of the trouble, it may be impossible to give a positive opinion on the case. And in the obscure illnesses of children one must, therefore, speak with caution, and, while taking care not to give unnecessary alarm, hold oneself open for serious contingencies. Certainly, one should not rest content with the acceptance of the suggestion of the nurse, or mother, that the illness may be the result of teething; and it is well to be continually on the watch against the insidious onset of infantile paralysis.

The tenderness which lingers about a limb which

* Maigie and Pepper; "Diseases of Children," page 681. 1872.

has been implicated in essential paralysis is apt to mislead. An infant of fifteen months was brought for treatment on account of "hip joint disease." Some months previously it had had an attack of "bilious fever," with, evidently, pains in the head. Soon after this an orthopedic surgeon was consulted. The child did not move the left lower limb, as it did the right, and cried when the leg was roughly handled; a heavy apparatus was fitted; but it was soon discarded. The child was rickety; the left leg and thigh were weak and flabby. On carefully raising the thigh so as gently to rub the head of the femur in the acetabulum, no signs of distress were evinced. There was no fulness in the fold of the groin, nor was there that other characteristic sign of the joint trouble, flexion of the limb. (See page 491.) Infantile paralysis was therefore diagnosed, and it was then ordered that the limb should be kept warm. Regular employment of massage was also to be thoroughly carried out, and cod-liver oil inunction was to be used. In a few weeks the child was able to walk a little, though he still dragged the limb. With hip joint disease the limb would have been advanced, not dragged. The subsequent progress was satisfactory.

Treatment.—The gums may be inspected, and the bowels cleared by a dose of rhubarb and soda, or grey powder. The infantile child must be nursed, petted, and kept warm; but it may not be expedient to keep him in bed. Small doses of bromide of potassium may allay irritability; likewise, a mustard plaster, or a stronger irritant, may be placed over the cervical or lumbar enlargement of the cord, as the case may be. But until tenderness has disappeared from the limb, and the general disquietude has passed away; and until it has become evident which muscles are affected, electrical treatment should not be resorted to. Nor is it advisable to worry the child with electricity, for

the purpose of diagnosis, until his health is re-established.

The development of the limb is affected, and the circulation in it is slow; this should, therefore, be enclosed in a thick stocking or sleeve, the interior of which may be lined with a layer of lamb's wool. Frictions, in frusts of the fur, may be performed at frequent intervals during the day, by rubbing the hand in the direction of the venous system. The mother or nurse may be instructed in the principles of massage, and mere faith may be placed in this valuable aid than in electricity. The treatment must be persisted in, if necessary, for months or years. "Much good often results from putting the child in a 'go-cart,' where, in order to move about, the affected muscles must be called upon to act."* If the child possess sufficient intelligence, he must be made to try to set the feeble muscles in action by force of will. This is a very valuable measure. His games and toys should be arranged with a due regard to this matter.

The continuous current will serve to assist nutrition until the central damage has been repaired. Later on, the interrupted current may be used, the electricity being just sufficient to produce a visible effect. Iron and strychnia may be prescribed, and the limb rubbed with oil. Too much reliance must not be placed upon electricity alone. When atrophy and deformity are established, no treatment can serve; electricity cannot restore a connection between nerve fibre and cell, nor create fresh elements in the damaged corns of the grey substance. Improvement, excepting in those muscles which are already in progress of amendment, can scarcely be hoped for after the lapse of eight or ten months from the commencement of the disease.†

* Halsted: "Principles of Surgery," page 490. 2nd edition.

† Dr. Huxley: "Theory and Practice of Medicine," 1878.

For the treatment of deformity from paralysis, see page 490.

For paralysis of the flexors of the ankle, every effort should be made to prevent the foot becoming extended to more than a right angle, or the toes will be in the way during progression. Frictions and manipulations may do much towards preventing this deformity; but a stiff boot, or even cast-iron, may be found necessary.

The surgical treatment of muscles elongated from paralysis is considered, so far as the foot is concerned, later on. Keetley has recently excised segments of the quadriceps extensor femoris in two cases, uniting the separated fragments by buried cat-gut sutures. To be of service such operation should be performed before all response to electrical stimulation has passed away.

Acute encephalitis, polio-encephalitis, may be followed by paralysis, of cerebral origin, such as the spinal disturbance is associated with paralysis of certain groups of muscles.* Strumpell remarks that it suddenly attacks children who may be in robust health. Of twenty-four cases observed, seven were in the first year, eight in the second, and four in the third. It comes on with fever, vomiting, and convulsions, which may persist for hours or weeks. This is followed by paralysis of one half of the body, which may come on suddenly, or may be delayed. The paralysis is rarely complete, or the recovery perfect. The lower parts of the face are rarely affected, but strabismus may occur. Some cases present general stasis rather than paralysis. Irritation of motor centres may occur later, the patients very commonly becoming confirmed epileptics, the attacks beginning in the paralysed side. There is, in fact, symptomatic epilepsy, indicating local lesion of the cortex; in some

* See *Edinburgh Med. Journal*, May, 1865.

cases there is an arrest of growth in the paralysed extremities.

PSEUDO-HYPERTROPHIC MUSCULAR PARALYSIS.

The adjoining figure (Fig. 16) taken from a patient at the Children's Hospital, shows some of the characteristic features of this disease. The calves and buttocks are enlarged, and there is an arching of the loins. The hypertrophy is symmetrical.

Microscopic examination proves that the increased size of the muscles is due to development in their substance of connective and adipose tissue, the muscular elements themselves being less plentiful than normal. These changes are associated with weakness; the boy (the subjects are generally boys) is perpetually falling about.

When the disease has advanced the walk is peculiar; the child steps along like a bare-footed hatter descending a shingly beach, and endeavours to preserve his balance by keeping the legs wide apart, and by throwing out the arms (Duchenne). The heels being drawn up, he walks much upon the toes. He cannot stand firm, but falls forwards; the shoulders are thrown back, in order to render the equilibrium more stable. Thus, arching of the loins is



Fig. 16. — Pseudo-hypertrophic Paralysis; enlargement of buttocks, buttocks, and calves.

produced, but when he is in the recumbent position this hump disappears. The weakness of the gluteal muscles renders the getting up from the floor a difficult task. The straggling gait, with weakness and unsteadiness, should direct attention to the muscles, even before hypertrophy has appeared.

The boy looks well and happy, and when the hypertrophy is excessive the large limbs make him resemble a little Hercules, or one of those massive children depicted by certain of the old masters.

On May 12th, 1884, Lockhart Clarke and Gowers gave * an account of the examination of a boy who had succumbed to this disease (the heels were drawn up, and the knees rigidly flexed; the former condition was relieved by tenotomy, the latter by forcible straightening; so that with steel supports he had managed to walk about a little. The muscles of the calf, which were at one time hypertrophied, had much wasted before death):

Autopsy.—The gastrocnemii presented the appearance of a mass of adipose tissue. Transverse sections of the spinal cord, hardened in chromic acid solution, revealed varied and extensive lesions. There was disintegration of the lateral grey network between the posterior horns and the intermediolateral tract. One lateral half of the anterior white commissure was entirely destroyed. There was sclerosis of the lateral and posterior white columns.

Prognosis is unfavourable. The degenerative process may extend to the arms, and even to the muscles of the chest and abdomen. During this final stage there is a rapid decrease in the size of the hypertrophied muscles. Death occurs, before adult age, from sheer prostration, or from some intercurrent affection of the respiratory organs†

* *Transactions of Med. Soc. Lond.*, vol. 1st, p. 117.

† *Malpica and Poppel*; "Diseases of Children," 1892.

Whether the muscular degeneration is the primary condition, or whether it is secondary to some pathological changes in the spinal cord, is not known. The treatment, however, may be directed to the muscles themselves, and should consist in massage and galvanism. Possibly, in the early stage of the disease, these measures may be attended with some success.

Tetany.—The chief feature of this peculiar disease is the muscular spasm, the flexors of the extremities being rigidly contracted. The disease may be dependent on rickets. "Attacks of tetany are frequently attributed by the public to teething, and on this view the doctor who is called in sometimes lances the gums; this has been done in the case of one of my patients, without benefit. Seeing that in rickets dentition is always more or less interfered with, is it not more reasonable to refer the phenomena of tetany to the rickety condition itself, rather than to an outcome of this?" Sometimes the hands and feet alone are affected. "The thumb is adducted, but the terminal phalanx is not flexed, thus differing from the position in the ordinary convulsions of children." The first joint of the fingers is flexed, the other joints being extended. In the slightest form of the disease the thumb alone is affected; the sole is arched, and the toes are flexed. Opisthotonos and trismus are rare complications. The rigidity of the muscles persists during sleep, nor is it affected by the administration of chloroform; these facts may be considered as evidence of the spinal origin of the disease. Complete intermissions in the rigidity are rare.

Laryngismus stridulus (page 29) is spoken of as a constant symptom of tetany, as is also irritability of the facial nerve; passing the finger over the nerve trunk sufficing to cause contraction of the sphincter

* Abernethy, 1800.

fibres of lips or eyelids. The disease has a tendency to relapse; mild cases get well spontaneously.



FIG. 17.—*Spont. Paralysis.*

Treatment.—Attention must be paid to diet, and rickets must be treated (page 60), diarrhoea checked (perhaps by the administration of castor oil), and tonic of oil and iron prescribed in due course.

Cases of **spastic paralysis** are often met with at the Children's Hospital, not, perhaps, because the disease is common, but because, proving unsatisfactory to treatment elsewhere, the children are brought on thither as a last hope. Goodhart describes* the disease as one of gradually developing motor paraplegia or hemiplegia, associated with muscular twitchings and contractures. The rigid limbs are moved with difficulty; the toes scraping along the floor. There is no affection of sensibility, no wasting of the muscles, and no disturbance of the functions of the bladder. It may come on suddenly, and is often associated with fits or with incontinence.

Case.—A child of ten years was in the Locomotor ward with hips and knees permanently and rigidly flexed, the left knee showing a considerable amount of three-fold displacement of the tibia; the left foot was everted, and the toes were stiff. The thighs were so firmly adducted that a pad had to be wedged between the knees to prevent ulceration. The application of stirrup and weight effected no improvement; but the foot began to swell directly after its adoption. To touch the surface of the body was to send the tensor fasciæ femoris into spasmodic contractions. The child complained of general pains. The administration of chloroform was of no benefit, nor was a gentle straightening of various joints under its influence; indeed, no treatment was found of avail.

Prognosis.—Goodhart truly remarks that it cannot be very hopeful, though he instances the case of a boy who was attacked in his third year, had learnt his letters before he was eleven, and could walk a little. Surgery can do little for these cases; massage gives no result, and tracheotomy is disappointing.

Neuro-mimetic (hysterical) affection of the spine, hip, or other joint or tissue, is met with

* Op. cit., p. 600.

occasionally, even in early childhood, and in either sex. Some of the signs of joint disease are closely imitated, but, as a rule, there is no wasting of the muscles of the limb, an early sign of joint disease. The child believes that he cannot move the limb, and usually keeps the joint partially flexed. There is no redness or heat of the surface, nor any swelling. Sometimes it is a difficult matter to say whether there is incipient disease or not, and if in doubt, it is advisable to keep the child at rest, and the part under close supervision before expressing a decided opinion. Warrington Howard gives an instructive report of a case of neuro-mimetic distortion of the foot in a boy of eleven years, who was brought for operation.*

Diagnosis.—If the child's attention be directed to the "painful" part, and the skin be even lightly touched, he will be apt to wince; but if attention be drawn away, as in the case of concentration of a distant part (of the chest wall, for instance) the fingers of the other hand may be thrust into the tissues which were previously so "tender," without the least discomfort. Neuro-mimosis invariably overacts its part, or the correct diagnosis might more often escape recognition. Sometimes the child may afford clear evidence of nervous or physical weakness; in some cases it is not improbable that blame may be ascribed to educational over-pressure. Generally, the chief part of the pain and tenderness are located in the skin.

Trismus nascentium is a rare disease in Great Britain. It generally comes on from the fifth to the tenth day after birth, and is popularly called "nine-day fits." Though it must necessarily occur soon after the umbilical cord has sloughed away, its invasion has probably no more than an accidental association with umbilical granulation.

* A treatise on "Orthopedic Surgery," p. 26.

Following the lead of Marion Sims, Hartigan ascribes the disease to extrusion at the base of the brain and medulla, the result of inward displacement of the occipital bone; there being in most cases a definite overlapping of the lateral margins of that bone by the posterior border of one or both parietals.

Prognosis is exceedingly grave; but Hartigan affirms that if midwives be taught the expediency of keeping the infant from assuming the supine position, so that the occiput be kept always free from pressure, the result of treatment is promising. He goes so far as to suggest that if the displacement of the occiput cannot be corrected by postural treatment, the bone should be elevated by definite though simple operative interference.

As regards drugs, castor oil, opium in the most minute doses, and bromide of potassium, might be employed, and chloroform might be administered if the tetanic convulsions were severe.

Neuralgic pains are apt to occur in the course of a girl approaching puberty. They should excite no alarm, being almost physiological in their nature. They may be relieved by belladonna liniment, or by friction with oil. Laxative iron mixture might be prescribed.

CHAPTER XIII.

CERTAIN MALFORMATIONS OF HEAD AND NECK.

Chronic hydrocephalus is a collection of fluid within the cerebral ventricles, the brain substance being expanded and thinned. The fluid may increase so as to cause separation of the cranial bones, and to

leave the sutures represented by a wide membranous film, the brain substance being represented by a cyst-like layer of nerve tissue which is spread inside the expansive cranial cavity. The excess of fluid may be the result of a slow inflammation of the arachnoid, and of the lining of the lateral ventricles, which may have existed during foetal life (West), or of a blocking of the cerebro-spinal opening, so that "the fluid could not escape from the interior of the brain" (Hilton).

The face is small and old-looking, and the forehead and head excessively large (Fig. 18).



Fig. 18.—Chronic Hydrocephalus.

Treatment.—Nothing effectual can be done for the child, but some slight elastic compression may be applied and tonics may be administered. There will be imperfect innervation, and the child may gradually sink. Repeated tapping of the ventricles has met with little success. If compression

be employed, strips of Lister's soap plaster may be used, about half an inch wide, and long enough to reach from each mastoid process across the vertex to the opposite orbit and crossed obliquely: other strips are to be fixed across from one temporal region to the other, and a long strip is to be covered around the base of the skull, the ends of the other strips being turned up over it, and a final turn or two brought round over these ends. But whether this treatment be adopted, or that by an elastic band, careful look-out must be kept for compression symptoms; in one case the ethmoid bone was disarticulated by the fluid pressure, and death supervened.

Acute hydrocephalus is the result of tubercular inflammation of the meninges of the brain (page 58). The surgeon meets with it chiefly as

a first complication of strumous disease of bone or joint.

Meningocele is the protrusion of some part of the membranes of the brain through a gap in the skull, the result of imperfect ossification; it may be caused by hydrocephalus during intra-uterine life. The usual situation of the tumour is at the occiput (Fig. 20), the root of the nose, the inner angle of the orbit, or the parietal region. If the deficiency existed at the sphenoidal region, there might be a prolapse into the pharynx or nasal fossa. From the dragging of the tumour, and the progress of ossification, the inferior of an occipital meningocele may become at last completely cut off from the interior of the cranium.



FIG. 12.—*Anterior Meningocele.*

Encephalocele is a tumour of like nature to the preceding, but with the addition of some of the cerebral substance. Fluid may intervene between the protruding brain substance and the membranes, the condition being termed hydro-encephalo-meningocele. But the fluid is usually contained within the distended cerebral ventricles. A favourite situation of the protrusion is the occipital region, where the gap may allow of the escape of much of the cerebral hemispheres. The condition is generally associated with internal hydrocephalus, and some portion of the lateral ventricles, distended with fluid, may be extruded in the cerebral substance. If the tumour be translucent it probably consists of dura mater with cerebral-spinal fluid only.

The diagnosis may be for a time doubtful, but the surgeon would pause before interfering with a

falsehood of sanguineous nature over or near to a cranial suture. A meningocele at the root of the nose (Fig. 19) might be mistaken for a cystic tumour (page 124) or a naevus. The situation of the tumour over a suture, the wide and deep excavations of its base, the history, the strange appearance, the absence of skin-staining would help in the differentiation. The diagnosis between one of these protrusions and a blood tumour of the scalp will be helped by the situation of the swelling; the cephaloematoma is



Fig. 20.—Occipital Encephalocele.

usually over the middle of the parietal bone, where a meningocele would be unlikely to be found. Compression of a blood tumour would not give rise to convulsions or other cerebral disturbances; a meningocele is congenital, and some of its fluid can be expressed into the cranium. Hydrocephalus would suggest intracranial connections of the tumour.

Treatment.—The tumour may steadily decrease, and ossification block up the abnormal opening. If the growth be perimantled, the weight may cause a gradual elongation and narrowing of the pedicle and ultimate separation from the cranial cavity. In some cases, the tumour, continuing to grow, at last gives

way, either from a sloughing of the thin integument or from accidental violence; fatal convulsions may be the result, but in rare cases obliteration of the tumour has thus been happily established.

If from the size and opacity of the tumour it were suspected that some cerebral tissue were in the cyst, no treatment would be advisable. Nor should active measures be undertaken if the tumour be associated with hydrocephalus, nor if a spina bifida exist.

Pressure applied by means of an elastic band might help to squeeze the contents of the cyst into the cranial cavity. The mere withdrawal of some of the fluid may give rise to convulsions and death.

If the tumour be translucent, unassociated with hydrocephalus, and in communication with the interior of the skull by a seemingly small gap, it might be expedient to treat it after the manner of a simple spina bifida; or if its pedicle were slender and appeared solid, it might be removed by the knife or ligature.

Noble Smith has reported* the cure of an infant whose occipital meningocele he had cured by repeated injections of Morton's iodo-glycerine solution (page 231), in eight minim doses. The injection was passed deeply into the wall of the sac (not into its cavity), the object being to influence the cyst wall, especially towards its inner lining. It would be impossible to predicate from a single case, but the method employed is worthy of attention and of farther trial and report.

MALFORMATION OF THE EXTERNAL EAR.

The pinna is not an important part of the organ of hearing, and in certain instances both it and the external meatus fail to be developed. Or the pinna may be present and the meatus absent. The meatus may be completely or partially blocked by a septum of false membrane. Sometimes the pinna is found

* *Lancet*, August, 1884.

curled upon itself or snarled over the proper site of the nostril. It is doubtful if an attempt to open up a nostril by dissection is likely to be successful, as the existence of a nostril beneath a rudimentary pinna is problematical. Occasionally one sees the pinna elongated and pointed in a suggestive manner.

If the pinna be directed forward so as to stand out from the side and give promise of future usefulness, it may be flattened against the side of the head by a fold of soft wood and a bandage or strapping.

Instances of **supernumerary auricles** are on record; like the **pendulous growths**, they are occasionally seen in the neighborhood of the ear (Fig. 23). They should be removed during infancy. Occasionally they are found along the front of the neck; their formation is due to a certain redundancy of tissue left after the closure of the visceral clefts.

Development.—The lower part of the face and the upper part of the neck are originally mapped out

in four processes, the visceral arches. From the highest of these the lower jaw is built up. Clefts are placed between the arches; they extend through into the pharynx. From the highest of them the Eustachian tube and the tympanum are developed; the lower clefts, which represent branchial apertures of aquatic animals, undergo obliteration. The auricle is formed from integument behind the external nostril.



FIG. 23.

(See Chapter on Anomalies of the Ear and Nose.)
H, highest visceral arch; E, second; M, third; O, lowest; C1, C2, C3, C4, clefts between the arches.

Branchial fistulae.—Small congenital apertures may be met with extending towards the pharynx or oesophagus, from one or both sides. Often they are just above the sterno-clavicular articulation or along

the front of the sterno-mastoid. Clear mucus may exude from them. They are remnants of the visceral clefts, and may generally be effaced by a caustery needle.

Branchial cysts of the neck result from imperfect closure of the visceral clefts. The cysts result from a proliferation of the epithelial elements of the undeveloped tract, and may be found near the pharynx. They are round, ovoid, and smooth, and may contain mucus, spherulous material, or blood. Should a cyst become distended with a fluid which, when drawn off by aspiration, is found pale or amber-coloured, the condition might be called **hydrocele of the neck**. (See also congenital cystic hygroma, page 120.) In the young child the cyst may not attract notice, but at any period its epithelial lining may be aroused into activity, when the cyst will become distended by fluid.

Treatment.—If aspiration and the injection of tincture of iodine fail, and if the cyst continues to grow, drainage with antiseptic precautions may be adopted, or an attempt made to remove the cyst wall by dissection. But in proposing this the possibility of the existence of deep and important connections must be anticipated.

Wry neck or torticollis is due to contraction of the sterno-mastoid; but neighbouring muscles become associated in keeping up the deformity, these other muscles being atrophied from want of exercise.

Causation.—The cause of the contraction may be a partial tearing of the muscular fibres during labour; irritation set up by spinal issues (page 243); inflammation of cervical vertebrae from wet or cold; glandular inflammation or suppuration; cerebral irritation of the brain or spinal cord, and contraction of matrix after birth.

Congenital wry neck.—The pathology of the congenital form of wry neck is thus explained:

During the birth of the foetus, either from the force of the expulsive efforts, or from the traction exerted by the medical attendant or midwife upon the feet, the sterno-mastoid is partially ruptured within its sheath, blood being extravasated between the torn ends. One may even find tumour in the course of the muscle in infants whose entrance into the world has been so easy that neither nurse nor midwife had the opportunity of assisting.

In the short and fat-necked infant, the tumour resulting from extravasation of blood may pass unnoticed for days or weeks; as the neck grows the swelling attracts attention. The tumour may exist in the sternal or the clavicular part of the muscle or above the junction of the two parts. The lump is tender for a while, but as it becomes more consolidated the infant suffers no pain on its being fingered. It may be of the size and shape of an almond, filbert, or small walnut, its long axis being in the line of the muscle. In order to keep the swelling free from pressure, and to slacken the muscular sheath, the infant keeps the head persistently drawn down towards that shoulder, and the subsequent contraction of the cicatrix produces a permanent deviation and an arrest of development of that side of the face, even to the bones.

These sterno-mastoid tumours were formerly taken as a manifestation of constitutional syphilis. Dr. Freik Taylor has examined one of these post mortem (the child happened to be the subject of the congenital taint), and found in it fibrous tissue and shreds of striated muscle, the former being probably organised blood clot.*

Having long been of opinion that these tumours were associated with the causation of wry neck, I at last met with a youth whose birth had been "cross-wise;" in whose neck a tumour had been noticed

* Trans Path Soc., vol. xxvi., p. 278.

directly after birth, and who, it was stated, had all his life kept his head drawn down to the shoulder of the side on which the lump had existed during childhood.

The **appearance** of the child with wry neck is characteristic: The occiput is drawn down towards the nuchal process, and chin and face are directed towards the opposite shoulder. The shoulder of the affected side is raised, and that side of the neck is short and convex, the hollow being bridged across by the prominent tumour. From the constant dragging upon that side of the face, the commissures of the mouth and eyelids are drawn, and even the bones, especially the inferior maxilla, are imperfectly developed.

The **treatment of congenital wry neck** varies with the age of the patient. In an infant, as soon as the tenderness has passed away, gentle frictions may be made along the course of the muscle, and, the shoulder being depressed, the head may be encouraged towards the straight line, and even beyond it. This is the prophylactic treatment of wry neck, and it will usually be found to suffice for removing all deformity if carried out with patience. No special treatment will be required for the tumour, though frictions may expedite its disappearance; no apparatus is needed.

Tenotomy.—If the child be older, and other treatment prove insufficient, it may be advisable to divide one or both heads of the sterno-mastoid, half-an-inch above the clavicle, where the band can be clearly felt beneath the skin.

The child should be anaesthetised, and placed upon a table (or on a low chest of drawers) in a good light. The side of the neck should be cleaned, and the course of the more prominent band of muscle made even more definite by the head being drawn up. A narrow-bladed knife, with a sharp point, is passed through the skin quite close beneath the fibrous band, and on this

being withdrawn, a blunt-ended blade is introduced, and the section effected. It is not advisable to divide the hand with the sharp-pointed blade.

A pad of dry lint is secured over the punctured wound, the hand being left in the old position. If the other head of the muscle require division, a second skin puncture should be made, as in the endeavour to reach that head from the original puncture a large vein might be wounded.

After-treatment.—When the skin wound has sensibly healed, gentle massage must be begun, and stercoræ bands, which now assert themselves, must be worked at with the thumb until they yield; they will not require division. The child should be made to sit on a footstool, whilst the surgeon takes the head between his knees, and gently, but firmly, works at the neck. This should be done once or twice a day, and the nurse should be taught to practise the same manipulations. At frequent intervals during the day the child should be made to walk with a weight hanging down in the hand of the affected side, whilst, at the same time, he inclines the head towards the opposite side. At night he should lie with the affected side of the head resting upon a firm pillow of a proper thickness, so as to keep up a constant though slight strain upon all shortened bands.

With equal confidence and satisfaction I venture to affirm that by the adoption of these measures no mechanical apparatus is needed in the cure. The hands of the surgeon and the nurse, and the voluntary exercises of the patient, may accomplish all that screws, iron, and straps can do, and, moreover, with greater satisfaction and comfort.

Risks of the operation.—The operation of tenotomy of the sterno-cleidoid is not without risk, and should not be undertaken in early childhood until the gentler treatment has had fair trial. One danger is

from the blade transfixing some tributary of the subclavian vein at the root of the neck. Such veins may generally be avoided by keeping the knife close under the tendon. If, notwithstanding this precaution, much blood well up through the skin wound, the operation should be desisted from, and a thick pad of lint firmly pressed over the wound, with many turns of a soft roller, passed round by the arm-pits. After an interval of a week or two the operation may be completed, this time through a different skin wound.

Another danger is that of air passing into the venous circulation through a wounded vein; for if air be carried into the right side of the heart, and churned up with the blood, alarming syncope may occur. The veins are close to the skin on the one side, and to the large subclavian trunk on the other, and the accidental wound is stretched widely open by the strained position necessary for convenient section of the muscle. The accident has happened in my own practice; fortunately the collapse did not end fatally. The subclavian vein itself is hardly likely to be punctured if the knife be kept close against the head to be divided. The subclavian artery is well below the course of the knife. Tremor should not be performed by introducing the knife between the skin and the muscle.

Caries of the cervical vertebrae may cause wry neck. The diagnosis may escape recognition, perchance, in the earlier days, the disease for which it is taken being generally rheumatism. (See page 244.) The first symptoms will be neuralgia in the area of distribution of the occipital nerves, in the neck, front of chest, shoulders, or arms. The scalp pains the child is apt to call "headache." Children are not clever at describing pain, but they may be trusted when they affirm that a part "aches," or is "sore." When wry neck is associated with obscure pains in the regions indicated

above, and is increased by steady pressure upon the head: when the child sits with his chin supported on his hands, and, on being told to turn his head, wheels his whole body round, and refuses to shake or nod his head, there can be no doubt about the deformity being caused by vertebral disease.

Stiff neck.—A girl has been under treatment for a sudden deviation of the neck from inflammation of the cervical tissues generally, after her wearing a hat which was sopping wet. Probably the inflammation was greater in the tissues on one side of the neck than on the other, as a single sterno-mastoid was contracted. Pressure on the head and upon the spinous processes gave distress. After four days in bed, the head being steadied between sand-bags, and with the use of fomentations under oil-silk, the child became convalescent. Stiff neck from cold is often of this nature, though in a less marked degree. It is best treated by rest and warmth.

When a lymphatic gland is acutely inflamed beneath the deep fascia, the pressure is taken off from it by persistent contraction of the sterno-mastoid of that side, the torticollis disappearing on the subsidence of the inflammation. So also with deep cervical abscess.

Stiff neck may persist after convalescence from mumps. These cases are best treated by massage and education, as suggested on page 172, and by iron tonics. I have met with very neck in a boy, in whom the deviation was the result merely of habit. With judicious supervision he was soon cured.

The occurrence of contraction from the irritation of intestinal worms or teething is possible. The rigidity would be induced through the cerebro-spinal system, acting through the spinal accessory nerve, or through a cervical nerve supplying the sterno-mastoid.

Hysterical torticollis is not common. Complaints of pain and suffering will probably be described

in exaggerated terms, certain symptoms being but imperfectly imitated. The patient would most likely experience great distress on the skin of the neck being gently pinched.

Deviation, due to the contraction of an extensive cicatrix after a burn, will but in rare instances be improved by plastic operation. The shortened band may, however, be made to yield somewhat by massage and exercise.

Obstinate contraction from **tetany** (page 159) is a rare condition. It would probably be associated with contractures of the flexor muscles of arms and legs.

CHAPTER XIV.

THE MOUTH, PHARYNX, AND EAR.

Development.—The first that is seen of the buccal cavity is a wide cleft beneath the fronto-nasal process; laterally it is bounded by the maxillary processes, and below it the mandibular plates are advancing towards the middle line.

As shown in Fig. 21, the fronto-nasal and the maxillary processes are at this time separated by a fissure, which extends from either side of the mouth into the orbit.

Aurea oris.—At birth the mouth has in rare instances been found completely closed. The treatment is to bring a flap of the mucous membrane over the freshly cut lip surface, and there fix it by fine



FIG. 21.—Development of Face.

F, fronto-nasal process; M, maxillary process; N, nasal process; H, mandibular plate.

natures. Cooper Forster has described a case in which the mouth was found so small as only to admit a fall-sized bottle. To this deformity the term **microstoma congenitum** has been given.

To diminish the risk of closure by cicatrization after operation, the mucous membrane should be drawn well over the raw surface. Constant dilatation will be required to maintain the size of the opening.

The small mouth is not necessarily a congenital defect; it may be caused



Fig. 20.—Congenital Constriction of Mouth.

by the puckering and contraction which follow in the healing of syphilitic ulcerations (Fig. 22), or after the healing of a severe burn.

The child being in a good state of health, a plastic operation, on the principle described above, may be undertaken.

Macrostoma congenitum is the opposite condition to that last mentioned, the corners of the mouth being extended through the cheek, and towards the angle of the jaw. The defect may be traced to arrest of union between the maxillary process and the first branchial arch (Fig. 23^a); it is likely to be associated with imperfect growth of the lower jaw.

Errors of development in connection with the branchial arches are said to be more frequently met



Fig. 23.—Large Mouth; good growth of lower jaw. (See also page 208.)

^a After Morgan; Trans. Med. Clin. Soc., vol. lxx.

with in girls than in boys; hare-lip, on the other hand, is more often seen in boys.

If the **orbital fissure** (Fig. 21) be not obliterated by the fusion of the fronto-nasal and maxillary processes, the mouth will be extended towards the eyelids, as shown in the figure which is depicted in Mason's "*Lithuanian Lectures*" (p. 104).

Kamula is a cystic tumour in the sublingual region. It causes a bluish and translucent swelling of the mucous membrane, which is soft. It has ordinarily no direct association with the salivary gland or its duct, but is merely an increasing collection of mucus pent up in one of the follicular glands of the floor of the mouth. The glairy fluid which escapes on puncture of the cyst is mucus, not saliva. The blocking of the duct may be the result of inflammation, or of the impaction of a concretion. The cyst is lined with columnar epithelium.

Simple puncture of the cyst rarely suffices for its permanent obliteration; nor does it always suffice to nip out a piece of the cyst wall; for the cyst being emptied the edges of the wound fall together and adhere, and before the fluid again begins to distend the sac, the cicatrix is strong enough to bear the strain of the increasing contents. The most prominent part of the swelling may be transfixed by a hook tenaculum, and that part of the cyst wall, which is thus raised, may be cut off by the scissors, placed beneath the convex part of the tenaculum. If the cyst again fill, a large silk suture may be laid through it for a few days; unless the suture be thoroughly well knotted the movements of the tongue and of the floor of the mouth will untie it. Cystic hygroma (page 120) may bear a close resemblance to kamula.

Atheromatous cysts may occur in this region. They are rounded and not lobulated. When the gradually

nature of their contents is discovered, they had better be removed by careful dissection.

Abscess in the floor of the mouth may be mistaken for *ranula*, unless the inflammation associated with it be acute, in which case the redness, pain, and thickening suffice for the differentiation. Error in the diagnosis is of little practical importance, as the cure is almost the same.

Congenital hypertrophy of the gum.—

Physiological activity may be so great that by the fifth week after birth many teeth may have appeared, a pink mass of gum tissue protruding between the lips; from exposure its surface may become skin-like. Repeated partial operations may be required to remove the disfigurement, and portions of the alveolar process may have to be sacrificed.*

Congenital cystic hygroma in the floor of the mouth may be mistaken for *ranula*; indeed, it is often impossible to make at once a positive and correct diagnosis. [A further account is given on page 120.] The sublingual region is often invaded by the cystic growth, which may find its way amongst the muscles until it bulges in the submental or submaxillary region. The mass is painless, lobulated, and evidently cystic.

In one case the growth extended with great rapidity, the tongue being pushed up until mastication and deglutition were extremely difficult; saliva ran continuously from the mouth, and the child grew thin. The submaxillary and upper cervical region became invaded, and the condition looked desperate. Then the growth underwent spontaneous inflammation, subsiding without incision, until nothing remained of it but a slight thickening; (though the condition is generally met with in early childhood, it is not always what its name implies, congenital). It would have been impossible to dissect out such a growth, for its

* See fuller article in "System of Surgery."

attachment would be exceedingly deep. Hygrota in the floor of the mouth might easily be mistaken for a sarcoma, it looks blue through the mucous membrane, but it generally contains larger cysts than would be found in sarcoma.

The **treatment** need not be precipitate; progress should be watched. If it be rapid, and threaten obstruction of the mouth, a seton may be passed through it, or prominent cysts punctured; inflammation caused by the seton might determine obliteration of the mass.

Nævus may affect the lips or mucous lining of the mouth, as a flat or rounded mass. If lacerated by food or by the tooth it is apt to bleed; sometimes bleeding is spontaneous; it had better be attacked with the thermo-cantery. During the operation the adjacent tissues should be protected from scorching by a fold of wet lint, and the heated tissue should be kept away from any neighbouring fold of membrane until it has cooled down.

Outgrowths from the gum may be of the nature of granulation tissue or simple hypertrophy; they may be scraped off with the end of a director or sharp raspator; an outgrowth of granulation tissue may be caused by a decayed tooth.

Epulis, a circumscribed outgrowth from the gum, is of somewhat common occurrence, especially on the lower jaw. The use of the gargo may effect its complete removal. If necessary, a tooth may be extracted or even a piece of the alveolar process be removed. (See page 114.) Often epulis is a simple fibrous outgrowth, without a trace of a sarcomatous admixture.

Dentigerous cysts may be associated with error in the development of a tooth. The tooth is properly formed, but remains imprisoned in the depths of a serous tumour. These cysts are totally distinct

in their origin and physiological meaning from those other tooth-bearing tumours, which are found, more in the ovaries or testes, and others variously distributed in the bodies of either sex.* The cysts are rarely connected with the milk teeth, but in the case of a cyst containing a tooth of the permanent set, the corresponding milk tooth lingers long in its place. If, then, there be a fluid swelling in the jaw, and a milk tooth be found long after the time at which it is usual for it to be shed, considerable help is obtained for the diagnosis; a certain tooth, moreover, is conspicuously absent.

The cyst may be of the size of a marble, or even of a small egg; it may grow into the nostrum and take its place, as it were. The bone is expanded, and occasionally the swelling is painful. The fingers readily perceive that the tumour is a central expansion of bone, and that it contains fluid; the bone walls yield to pressure, and then return to shape with crepitation, like the scolding of stiff parchment; on puncture, serum may be drawn off, and on a probe being introduced the missing tooth may be discovered.

Treatment.—A portion of the cyst must be excised, and the tooth extracted. Obliteration of the cyst might be accelerated by scraping, or by injection of solution of zinc chloride.

Lancing the gums is resorted to less frequently now that the diagnosis and treatment of children's diseases are better understood. Nevertheless, speculative incision into the tooth-bearing gum of an infant who suffers from constant fretfulness, diarrhoea, or convulsions, is occasionally resorted to; but to argue that, because the child improves after the operation, the lancet has afforded the relief, is illogical. Infants habitually recover from these conditions without the

* See Haller's Essay in the "System of Surgery," vol. ii. p. 438. 1803.

gum being lanced. Dentitish is a physiological process, and probably the diarrhoea had no direct association with it. These infantile troubles generally appear when weaning is taking place, and are often due directly to irritation of the intestinal tract by unwholesome food. There may be instances in which the lancet affords relief from entering the tooth follicle, but such are probably of rare occurrence.

A tense, swollen, and painful gum, over the cutting edge of an incisor tooth, must, after all, be exceptional; and it is somewhat strange that the child likes to have that same gum rubbed hard with the finger. Stodden thus expresses himself: "Many others, as well as myself, have never seen any result from this operation in any pathological condition."^{*}

A proper dietary, the administration of rhubarb and soda, castor oil, or bromide of potassium, will often do away with supposed need of the gum lancet. Probably, in not a few cases in which the use of the lancet has been followed by immediate relief, the wound has been actually healed again for weeks or months before the tooth has eventually appeared. If this be so, the argument is in favour of the relief being due to the local blood-letting rather than to any anæsthetic given to the advancing tooth.

But if speculative incisions be made into the gums of a child who is fretful because he is ill, rather than because the eruption of the teeth is meeting with abnormal obstruction, serious trouble may follow. If the child be weakly the loss of blood may suffice to extinguish his chance of existence, whilst if the blood-vessels be of impaired contraction, or the blood thin and uncoagulable (hæmophilia), the bleeding may be arrested only after a period of much anxiety.

The wounds in the tissue of the gum may be slow to heal, or may be involved in suppuration. The

^{*} Zimmerman's "Cyclopedia," vol. VII., p. 1122.

infant may suck the wounded gum, and so keep up exhausting hæmorrhage.

Bleeding after tooth extraction, which may be dependent on the hæmorrhagic diathesis (page 88), may best be treated by plugging the alveolar cavity with a mass of dry lint. If the bleeding have been serious the child should be constantly watched lest oozing entail a fatal exhaustion. The thrombo-cantury may prove useful in checking the bleeding.

Thrush; aphthæ (serre, fasten on).—Small curd-like patches are found upon the mucous membrane in early infancy; they may be the result of a "fastening on" of a fungus, the *oidium albicans*. (Ziegler affirms that the disease is entirely unconnected with fungi.) Beneath the flaky patch is a slight ulceration of the mucous membrane, and close around it is a hyperæmic ring. The flakes are of about the size of a pin's head; they may be scattered or confluent. Fresh crops of patches may occur throughout a series of days or weeks. Microscopic examination shows the fungus to consist of spores and branching filaments of long cells, which are destroying the epithelial elements. Sometimes there is slight suppuration.

The infant is restless and disinclined to suck; he may suffer from sickness and diarrhoea.

Treatment.—The mouth should be swabbed out after each meal with boric acid and glycerine lotion. At first the fungus is easily detached, but when it has implicated the deep layers of the epithelium, it is not so manageable. Attention must be given to the diet (page 8), and greater care paid, in the way of cleanliness, to the feeding-bottle (page 8), spoon, or cup. An occasional dose of rhubarb and soda will be required.

Ulcerative stomatitis occurs in children who have been badly fed and ill cared for. The mucous membrane is swollen, spongy, and dusky; the

inflammation may run on to ulceration or gangrene. The lining of the lips and cheek may be affected, the teeth dirty, and the breath offensive. The gums being destroyed, the fangs are laid bare; nutrition is so much interfered with that teeth may fall out or demand extraction. If the disease advances further the alveolar process may undergo partial necrosis. The disease is rarely dependent upon the abuse of mercury; but formerly, when that drug was given more freely, ulcerative stomatitis, shedding of teeth, and maxillary necrosis, were not seldom caused by it. Sometimes an attack of ulcerative stomatitis is the forerunner to cancerous oris. (See Plate I., Fig. 2.)

(The subject of spongy gums is also alluded to on page 64.) Occasionally one meets with stomatitis in children who have been brought up on a scurvy diet but who manifest no other direct evidence of that blood disease. Ulcerations may also be the result of syphilis, when other evidence of congenital taint will be obtainable (page 67).

Treatment.—The mouth must be frequently swabbed out with a lotion of chloride of potash or boracic acid (grs. 5 ad ʒj); sloughs should be picked out, incrustations removed, and all carious teeth extracted. A dose of rhubarb and soda should be given, and afterwards quinine, iron, or cod-liver oil. Fresh milk, vegetables, fruit, and meat may be required; sweet-stuff should be forbidden. Wine may be needed.

Follicular stomatitis appears in the weakly child, especially after measles; the treatment just described will serve. The domestic remedy is lemon and honey, and it answers well.

Maxillary abscess and necrosis* result from acute dental periostitis and alveolar abscess. The cheek grows swollen and red, tender and hard. The jaw is fixed by inflammatory deposit, a red line

* *Medical Press and Circular*, January 12th, 1881, p. 39.

appearing in the edematous gum around a discoloured or hollow tooth; sometimes, on gently pressing the cheek, ill-smelling pus wells up between tooth and gum. The child may suffer intensely, and may neither eat nor sleep. If the disease be allowed to run its course, abscess may open by the angle of the jaw, on the cheek, or chin. Later, a sequestrum may be discovered.

Treatment.—The diseased tooth must be extracted. Yet it sometimes happens that a dental surgeon refuses to extract a condemned tooth because of the acuteness of the local disturbance; and he injudiciously advises delay until the inflammation shall have quieted down. But if only he can get the blades of his forceps upon the tooth he ought straightway to extract it, otherwise necrosis might extend and suffering be needlessly prolonged. Popsy-head fomentations and poultices are out of place, but an elevator working from the outer side of the tooth affords prompt relief. If abscess have formed beneath the gum, and no individual tooth appear to be the cause of it, it will be well to incise the boggy tissue and to wait before extracting a tooth. In making the incision, the lancet or bistoury should be thrust freely down into the very depths of the swelling, the child being under the influence of chloroform. Attempt to open the abscess should not degenerate into mere scarification.

In the removal of sequestrum, the less the wounding of the skin, and the less the disturbance of the young tooth, the better. Whether the sequestrum be removed through the mouth, or by way of a sinus which opens near the angle of the jaw, must be determined by the nature of the case. Necrosis of the superior maxilla is rare, because its tissue is less dense than that of the lower jaw, and, therefore, better calculated to endure the effects of acute inflammation.

Both in the upper and lower jaw extensive necrosis

may be caused by the local effects of the poison of some exanthematous fever. While the process of exfoliation is taking place strength must be kept up by tonics; santonin wash and spray must be used to convert the fester of the breath, and sequestra removed as soon as possible.

CANCERUM ORIS.

Cancerum oris is an acute inflammatory affection of the cheek and lips, or even of the jaws; it rapidly runs on to ulceration and gangrene, and causes death of the child by exhaustion or blood poisoning. It is not a common disease; but it selects victims from wretched children who have received but little attention in the most important matters relating to hygiene. It is specially apt to affect the child whose physical condition has been exhausted by measles or some such ailment.

The **pathology** of the disease remains obscure; but the belief that the attack depends upon prolonged mercurial treatment is not now so prevalent as it was a few generations back. Some think that it has association with micro-organisms in the blood. In one case Sarsma had discovered in the blood, during life, swarms of bacteria. On injecting a few minims of the blood collected at the autopsy into the body of certain small animals, death quickly followed, and the fluids of that animal were found to contain similar bacteria.

Cancerum oris may begin as an innocent-looking swelling of the cheek or lip, the mucous membrane being the seat of a superficial ulceration; occasionally it follows on an attack of ulcerative stomatitis (page 183). Or the mucous membrane may be greyish, and covered with a foetl exudation. The swollen tissues are hard, and the skin is at first reddish. The breath is foetid, and there is profuse pyalism.

When the cheek is heavy and thick the interior of the mouth cannot be inspected without causing distress. The ulceration extends rapidly; the gums become gangrenous, the adjacent teeth loosen and are eventually shed. Extensive necrosis of the alveolar process of the maxilla may result.

A child under Mr. PEE was wretched in the extreme, and the gangrene advanced with alarming rapidity. An isolated patch of brown swelling appeared upon the chin, and the child seemed at the point of death. Under the influence of tonics, stimulants, and nuchectics, the gangrene eventually stopped, and the child recovered. Before treatment was commenced, one was struck by the richness of the colour at the infected part, the skin showing black, blue, purple, red, and yellow, according to the completeness of the destruction and the extent of the congestion and staining. The mouth and pharynx were laid open, and nearly the entire mass of the left superior maxilla came away.

Cooper Forsner gives* a graphic account of the disease, illustrating it with a chalcograph. More than half of each lip, the right nostril, and the right cheek had been destroyed.

The first indication for alarm may be a dusky or black spot, due to coagulation of blood in the distended capillaries, and partly, no doubt, to the escape of coloured corpuscles. Though the child may be unable to eat, drink, or swallow, "it is not a rare thing to find patients in whom gangrene has committed the most extensive and frightful ravages, and for whom recovery is hopeless, who neither suffer pain nor have suffered it, who maintain a good appetite, and continue sensible and even cheerful."†

The **prognosis** is highly unfavourable. The

* "The Surgical Diseases of Children," p. 75, et seq.

† J. N. Brewster, M.D.; "The Theory and Practice of Medicine," p. 611. 1878.

child may progress to rapid exhaustion, or, lingering awhile, may sink from diarrhea, leucorrhœa, or other effects of blood poisoning. Though he may struggle through the attack, he can hardly escape without permanent disfigurement. With the child's growth, the wound is likely to diminish in size, but the question may arise, when the health has been absolutely re-established, as to whether amputation may not be imposed by plastic operation.

The **treatment** should be commenced with a free dose of rhubarb and soda. Food must be administered at short and regular intervals, and if the child cannot swallow, he must be fed by a full-sized, flexible catheter introduced into the stomach through a nostril. (See page 48.) Nutrient elements may be administered. Wine, peptonised beef, milk, eggs, and beef-tes, will constitute the chief elements of the diet. The medicines will be quinine, iron, mineral acids, and perhaps opium. The last-named must be cautiously administered if the child be already threatened with coma.

The **local remedies** comprise the free application of strong nitric or carbolic acid, care being taken that the tissues be clean and dry to begin with, and that the acid do not flow over healthy skin; the operation is performed under chloroform. Or the infected tissue may be effectually and precisely destroyed by the thermo-cautery at the utmost heat. This procedure would be preferable to that of excising the gangrenous tissue with the scalpel.

The mouth may be swabbed with weak disinfectant lotions, the interior of the cheek being anointed with a mixture of vaseline and iodoform, or oil of eucalyptus.

Tongue-tie is a common congenital defect, varying much in degree. Sometimes the pale mucous band is tight enough only to check extreme protrusion

of the tongue; whilst at others the retraction is so complete that the tip of the tongue can hardly be brought beyond the level of the incisor teeth. In the latter case there would be impediment to sucking, the contraction demanding immediate treatment.

The **operation** is simple and almost painless. The infant's arms and trunk are steadied between the nurse's knees, the surgeon hooks the tips of the first and second fingers of the left hand under the tongue, one on either side of the frenum, and with a pair of scissors just nips the edge of the little cord; he tears through the rest of the frenum, and all is over. No anæsthetic is required, and no after treatment. There is no hæmorrhage of importance, for the lingual artery, as it runs along the under surface of the tongue, is held up out of harm's way by the fingers. The strip in the frenum should be just enough to start the subsequent tearing. If the incision be made too freely, or the tongue torn up from the floor of the mouth with unnecessary vigour, it may be so much loosened that the infant can suck it backwards, and even bring it within the grasp of the constrictors.

Tongue-swallowing is a troublesome condition; it may be necessary to have the child constantly watched, lest asphyxiation ensue. Possibly some form of gag might be arranged for the purpose of keeping the tongue in place, or a plastic operation on the floor of the mouth, with the view of establishing sublingual adhesions, might be undertaken. Possibly, even tracheotomy might be demanded as a precautionary measure against asphyxiation. The condition is apt to cause fatal dyspnoea.

Hypertrophy of the tongue: macroglossia, is a congenital disease; or, being slightly large at birth, the organ may soon afterwards take on growth. The tongue is too large for the mouth, and hangs out between the lips or over the chin. The mouth being

thus kept open, saliva constantly trickles down, though the tongue itself becomes dried from exposure. Where its surface comes in contact with the teeth ulceration occurs. Macroglossia is said to occur most frequently among idiots; but Fletcher Beach writes,* in answer to the question, that he has seen very few cases of it, and that those were slight in character, and required no operation.

Pathology.—The over-growth is due to congenital thickening of the lymphatic and connective tissue elements of the organ, the lymphatics being greatly dilated. The condition is thus allied to that of elephantiasis. **Macrocheilia** is over-growth of the lips from the same cause (Ziegler). Occasionally it attains enormous size. Barker, in his account of macroglossia, gives† numerous references. Out of one hundred and thirteen cases the enlargement was congenital in at least sixty. The tongue, being large, is constantly in the way of the teeth, and so the condition might be detected on the tongue being bitten; its enlargement might then be ascribed to injury. Macroglossia may be associated with hypertrophy of the connective tissue in other parts of the body.

Treatment.—If the tongue were so large as to protrude permanently from between the lips, compression by adhesive rubber plaster might be tried, or electrolysis. If more heroic measures were required, a V-shaped piece might be removed from its central part, the raw surfaces being brought together; hæmorrhage being arrested by wire sutures, passed so as to include the bleeding vessels. If this failed, it might be necessary to excise the tongue; thus local irritation would be removed, and due development of the maxilla and the eruption of the teeth ensured.

Acute glossitis causes the tongue rapidly to

* From Darnall Layton.

† "System of Surgery," vol. ii. 1868.

swell; the impressions of the teeth are found around its sides and tip. If the condition be associated with extreme dysphagia, incisions may be required along the dorsal aspect. Possibly, even tracheotomy might be demanded, especially if the swelling were accompanied with oedema of the mucous membrane about the epiglottis and larynx. The child would need constant watching. An astringent mouth wash and free purgation would be required. Ice might be sucked.

Abscess in the substance of the tongue generally comes on quietly. Its exact nature might escape recognition at first. Then it would become evident that in the depth of the soft lingual tissues was a cyst-like swelling. Puncture closes the discharges, and dissipates the trouble.

Cysts in the tongue, if superficial, are easily diagnosed; if more deeply placed, puncture would establish their identity. Cysts may also occur in the substance of the lip.

Nevus of the tongue is generally associated with growth of vascular tissue about the floor of the mouth or cheek. But when it affects the tongue alone there is no difficulty in recognising its nature, unless the lesion be altogether beneath the mucous membrane.

Treatment.—It is best dealt with by electrolysis or thermo-puncture (page 128).

Warts on the surface of the tongue had better be snipped off by curved scissors. The application of linear caustic or other escharotic is not a satisfactory way of dealing with them.

Simple ulceration of the tongue may be found near the fronsum, from the tongue coming in frequent and violent contact with the sharp edge of the lower central incisor teeth during an attack of whooping cough. It is more apt to occur in little children, in whom the edge of those teeth is still serrated. The treatment would be directed chiefly to the relief of

the spasmodic cough, jagged teeth being attended to or removed.

Ulceration from syphilis and tubercle is rarely met with in childhood.

Bite of tongue.—If the bite be superficial and without hæmorrhage, it may be left alone; but if the bleeding were to cause faintness or alarm, and did not cease on the application of ice or powdered alum, the vessel should be secured by a suture passed beneath it. Extensive wounds of the substance of the tongue should be treated with sutures, not so much with the idea of obtaining primary adhesion as of keeping the gap narrow for union by granulation.

Acute tonsillitis (quinsy) is of rare occurrence in subjects under puberty. Its treatment involves the continuous application of moist warmth to the outside of the neck, and early puncture of the swollen tonsil by a guarded bistoury. If the child resisted operative interference, an anæsthetic would be required, the mouth being held open with a gag and the tongue depressed. By thrusting the bistoury directly backwards into the enlarged mass the internal carotid artery would not be injured; it is secure on the outer and posterior aspect. Several punctures may be made in different parts of the gland. The general treatment would comprise free purgation, and a mixture of iron and quinine; an astringent may be of service; salicylate of soda in repeated doses, and wine, might be given. The child should not be within the influence of ill-arranged drains, sinks, or closets.

Differential diagnosis.—Simple inflammation of the tonsil must be distinguished from that associated with scarlet fever. In the former condition, though the temperature may be several degrees above normal, there is no redness of the tongue. Perhaps, also, but one tonsil is affected. A careful watch must be kept in case of the patch becoming covered with

diphtheritic exudation; this would be fixed to the mucous membrane (page 14). The throat should be frequently inspected, and if there were doubt, the child should be isolated (page 25).

Enlarged tonsils.—The patient's face often wears a vacant and characteristic expression. The mouth is constantly open, on account of the air being unable to enter the lungs through the obstructed naso-pharyngeal cavity. Thus the face may become permanently elongated, and, from want of use, the nostrils fail to be developed.* This condition is often a manifestation of the strabismic diathesis; the enlargement is due to hyperplasia of the lymphadenoid tissue in the gland.

Breathing is harsh and noisy, and the voice thick and peculiar, the pharyngeal cavity no longer acting as a sounding board. Deglutition is impeded, and when both tonsils are enlarged, only fluid food can pass the isthmus. An attack of catarrhal inflammation of the mucous membrane brings the masses into actual contact, rendering operation necessary. Sometimes the mucous membrane covering the mass is ulcerated, and the cervical lymphatic glands secondarily enlarged. When the tonsils are very large, inspiration is extremely laborious, and associated with a falling in of the walls of the chest; in this way pigeon-breast (page 24) may be produced.

Deafness is often associated with the hypertrophy, not from an actual blocking of the opening of the Eustachian tube, but rather from chronic thickening of the lining membrane which is continuous with that of the tonsil. The hearing may not be improved immediately after the removal of the tonsillar mass.

The **treatment** will consist in the administration of cod-liver oil and iron; at the same time astringent gargles will be used, or the tonsils brushed with

* Felix Semon, M.D.; St. Thomas's Hospital Reports for 1882.

glycerine of tannin three times a day. This palliative treatment should be given a full and fair trial; it sometimes succeeds where little might have been expected from it. As a rule, however, the treatment by astringents and external applications is of no avail.

The child should be put on a wholesome diet, and, if practicable, sent to a place where the air is fresh. He should be warmly dressed, but the neck need not be encircled in a woollen comforter.

Though the angle of the jaw marks the situation of the tonsil within, there is such a mass of intervening tissues that it is doubtful if the application of tincture of iodine, or any other drug, to the skin of that neighbourhood can be of therapeutic service; the parents, however, may derive comfort from the sight of a yellow stain upon the child's neck. Iodine as an external application seems to have acquired a widespread reputation; possibly not a little of its virtue rests in the colour which it gives to the skin. If left to itself the enlargement often diminishes as puberty approaches, though it may not entirely disappear. But if the child be young, and the hypertrophy considerable, the medical attendant will scarcely be inclined to suggest non-interference on the chance of an ultimate, though distant, subsidence. The indication for amputation is the obstructed passage of air to the lungs and of food to the stomach.

Operative treatment should be undertaken if after fair trial of general measures no equivalent improvement be manifest. If when the child was first seen the mass was hard, firm, and painless, but little direct improvement could have been anticipated, still the trial should be given. In the case of sickly children, the operation may be delayed until the health has been improved by medicine and diet; but generally, the sooner amputation is performed

the sooner will convalescence be established, and annoying "throat attacks" cease to occur.

There is a widespread superstition against amputation of enlarged tonsils; parents are apprehensive lest the voice should be spoiled thereby, or the sexual function impaired. The fear is groundless. Thus, young adults and grown persons, after long and unnecessary inconvenience, may find themselves compelled to resort to an operation which ought to have been performed in childhood.

Excision, or rather amputation of the tonsil, is not a very painful operation, but a timid child should not be submitted to it except under the influence of an anæsthetic. He should be sitting in a



Fig. 24.—Tonsil Guillotine.

chair opposite a good light, his arms and chest being secured with a towel. When under the influence of the anæsthetic, the assistant who has been administering it can take charge of the gag and the tongue depressor, or help by thrusting his thumb firmly behind the angle of the jaw, so as to make the tonsil project still farther into the fauces, but this is rarely needful. The mass may be removed by either the guillotine, or with the straight, blunt-ended bistoury and valsalva. If the guillotine be used it should be the simple one here figured; the complicated apparatus with spring and prong is not as trustworthy as ingenious. I prefer the bistoury and valsalva, amputating first the right tonsil with my left hand, and then the left with my right hand. A piece of practical advice is to have two valsalva, one for each

tonsil, for trouble and delay may be experienced in disengaging the teeth of the forceps from the amputated mass. If the operation be done without anæsthetic the loss of time which this freeing of the forceps involves is of importance, and especially so if there be much bleeding. Too little of the mass is apt to be removed unless the operator pull the tonsil well towards the middle of the fauces during the section; it is expedient to take away some of the gland which is hidden deeply behind the palato-glossæ. The internal carotid artery is not in danger.

Other ways of dealing with the hypertrophied tonsils have been suggested, such as electrolysis, and puncture with the blade of the thermo-cautery. Of the former I have no experience, nor do I desire it. The igni-puncture I have once tried, but then I made a permanent passage through the tonsil of the calibre of a slate pencil, and there it remained until, some months afterwards, the rigid mass was amputated. When once it has been decided that removal of the tonsils shall be undertaken, the more quickly and effectually the operation is accomplished the better.

After the return of consciousness the patient may suck ice, and be fed on an unirritating fluid diet. He should be kept in doors for a day or two. If serious hæmorrhage complicate the operation a piece of lint, dipped in an astringent, must be kept pressed against the bleeding surface; but such bleeding is exceptional.

Re-growth of tonsil after efficient amputation rarely happens. If too small a slice of the mass be taken away, a second and more thorough operation will eventually be demanded.

Tonsillitis in relation to febrile attacks.*

—A child is suffering from febrile disturbance with no distinctive symptoms; he complains, perhaps, of

* See clinical paper in *Med. Times*, Jan. 10, 1886.

headache, and is strongly out of sorts. Unless one makes an inspection of the throat, the probability is that the vesicles may be called "febricula" (whatever that may be), or may be ascribed to teething. In every case of obscure illness the tonsils should be examined as a routine practice. They may be found red and swollen even though no complaint have been made of the throat. The attack may be associated with languor and loss of appetite; with vomiting, or even convulsions. The differential diagnosis is from diphtheria (page 25), and this for a time may be held in suspense. Purgation and tonics may suffice, in the course of a day or two, to instilish convalescence. If the tonsils be enlarged it may be expedient to amputate them ere the child be again similarly attacked.

If chronic ulceration of tonsil be associated with hypertrophy amputation is required, or the ulcerated surface may be shaved off with a blunt-pointed bistoury. If the ulcers be large and superficial they may be scraped out with a Volkmann's spoon. If the ulceration be complicated with enlargement of cervical glands, the need of the removal of the unhealthy tissue becomes urgent, but at the same time every attention must be paid to the general treatment of the child.

Tubercular ulceration of the tonsils may be associated with follicular inflammation of the pharynx; at the same time there will probably be other manifestations of the tubercular diathesis.

Syphilitic ulceration from congenital disease is rare.*

Relaxed throat may be an association of chronic pharyngitis and tonsillitis, the result of cold or of imperfect ventilation. If chronic ulceration of tonsils persist after the breaking of follicular abscesses,

* *British Medical Journal*, Jan. 11, 1878.

the sore may be touched with lunar caustic, or with the point of the thermo-cantery. Every case of follicular inflammation must for a time be regarded with suspicion and dealt with cautiously. Little spots sometimes run together to form false membrane, and so follicular pharyngitis may be the precursor of diphtheria.

Uvula.—If when the tonsils are hypertrophied the uvula be found long and coliculated, it is advisable to remove a portion of it at the time the tonsils are operated upon. A long uvula may, by keeping up a constant tickling about the back of the tongue, be the cause of spasmodic cough, and of vomiting. The state of the uvula should always be examined when a child suffers from a cough which is unassociated with thoracic symptoms. Such a cough may come on after drinking anything warm; or may be at its worst when the child lies down. Painting the throat with astringents may check the cough for a time, but the best treatment is amputation of the uvula by long scissors and toothed forceps. The scissors may have a crescentic notch in each cutting edge, so that the uvula cannot escape section.

Post-pharyngeal abscess is considered in connection with spinal cord (page 252), to which condition it is generally due. It may, however, be the result of inflammation in the connective tissues at the front of the cervical vertebrae, and especially so after the occurrence of scarlet fever or diphtheria.

Tubercular disease of the naso-pharyngeal cavity* is usually associated with other manifestations of the diathesis (page 54). The disease begins with swelling and suppuration in the follicular glands; abscesses burst, and the mucus discharge becomes purulent, and even stained with blood. Ulcerations being formed, the surface of the mucous membrane becomes

* Ziemssen's "Cyclopaedia," vol. 66.

bony-combed or excavated. Healing is associated with cicatrization and contraction; thus the soft palate and other mucous folds may be dragged from their normal position and permanently fixed. The tonsils may also be implicated in the inflammatory process (but such cicatrization is more likely to follow on diphtheritic or syphilitic ulceration.)

The ulcers may have a steep or undermined margin, and a greyish, or bleeding floor. This condition of pharynx might be associated with inflammation of the middle ear, from extension along the Eustachian tube; or deafness may be caused by blocking of the opening of the tube by the formation of cicatricial contractions.

The **treatment** will be chiefly general (page 56), but if the ulcers be not hopelessly beyond the reach of practical surgery, they may be scraped clean, and subjected to insufflation of iodoform.

Adenoid vegetations* are of frequent occurrence in the naso-pharyngeal cavity. Often they are associated with enlargement of tonsils; they are the result of hypertrophy of the follicular glands. The child is the subject of naso-pharyngeal catarrh, is deaf, and cannot breathe freely. By the history of the case, by an ocular and digital exploration of the naso-pharyngeal cavity, the diagnosis is established. The tonsils, if enlarged, be dealt with first, and later on the vegetations would be removed with blunted-ended curved scissors. Dr. Largo regards† the affection as congenital, though it is most noticed between the tenth and fifteenth year. He removes the vegetations with a ring knife, rinsing the part afterwards with warm water and salt.

The **septum nasi** may deviate so much to one side as to cause serious obstruction of the nostril. By

* F. Simon: St. Thomas's Hospital Reports, vol. xii., p. 148.

† Even Medical Record, March 27, 1885.

the use of a small pair of sequestrum forceps (the blades of which are enclosed in pieces of drainage tube, so that their grip may not damage the bone) the septum may be deflected to the middle line, and even beyond it; and it may be bent over again from time to time as may be necessary. The nostril might be kept open by a piece of stiff drainage tube. If the septum were too large, a narrow triangular piece might be cut out of it by a tenotomy knife. Slight redundancy of the cartilage may be treated by an instrument like the leather-punch, by which small pieces may be taken out here and there. If any portion of the septum require ablation the mucoperichondrium should be raised from it. Deviation must not be mistaken for abscess of the septum; a probe passed up reveals a corresponding depression on the opposite side of the septum. In one case, the triangular cartilage protruded through a nostril to considerably below the level of the fleshy septum. Being detached of its mucoperichondrium, the projection was cut off with scissors, and the tissues adjusted by fine sutures; the result was satisfactory.

Abscess of the septum is associated with local heat, pain, and fulness. The part throbs, and is tender. A probe passed on to the other side of the septum shows that the fulness is not the result of a deviation of the cartilage. The pus is situated in and beneath the mucous membrane; a puncture with the lancet sets it free. The abscess probably begins around a mucous follicle. It need not be lanced unless it cause obstruction and irritation.

Epistaxis.—Bleeding from the nose is often a sign of constitutional weakness; a child who has suffered from it once is liable to recurrence of the trouble. Sometimes it is the ruddy child who is attacked, in which case the bleeding might possibly come as a relief to over-filled vessels in the head and neck.

The hæmorrhage may occur after excitement in play, or without apparent cause, and, passing off, may leave the subject but little the worse for it. Often it is the result of injury. When the bleeding is associated with the hæmorrhagic diathesis (page 48), the effect may be very serious, if not fatal. The bleeding may be secondary to malignant polypus or to an extensive ulceration, the result of struma or syphilis.

Treatment.—The child must be kept sitting or standing; if he become faint the head had better be raised. He must not be allowed to disturb the formation or position of a useful coagulum by blowing the nose.

The vaso-motor nerves may be stimulated to produce contraction of the arterioles by holding a cold stone, a large door-key, or a piece of ice to the tape of the neck; cold water may be applied to the forehead and nose. The nostril may be irrigated with water as hot as can be borne; after this ice-cold water may be used. Alexander Ure taught that lukewarm water gave the best results. If necessary, aëum may be dissolved in the water.

In a desperate case one remedy is apt to be tried after another. Solutions of iron may thus be followed or preceded by tannin, an unsightly ink-staining being, of course, the result. One has seen a case in which sloughing was produced by the use of strong solution of iron. I have never met with an instance in childhood in which it has been necessary to resort to plugging the anterior and posterior nares. It might be required, however, especially in the case of the hæmorrhagic diathesis.

Foreign bodies in the nostril.—Children are apt to push a button, bean, fruit stone, or similar object, into the anterior nares. Subsequently, in an attempt to extract it, one may thrust it up to the level of the nasal bone. If it cannot be seen, the boy's

statement of his exploit is apt to be disregarded; but if a nostril have become suddenly blocked, there would be evidence of the statement being correct. After a time the nose becomes tender, a nostril begins to swell, and a muco-purulent discharge escapes. Unilateral coryza is unlikely to be of constitutional origin. Possibly a thorough inspection of the nostril can be obtained only on the administration of chloroform and after preliminary syringing. On the introduction of a speculum the object may be seen and extracted. If the mucous membrane be much swollen, or the bone be so far up that it cannot be seen, its presence may be determined by the use of the probe. Removal may be effected by a pair of slender-bladed forceps, or by a curette extended on the end of a hair-pin slightly bent at its closed end. If it can be seen or felt it ought to be extracted in some way or another, as its continued presence would give rise to ulceration, and perhaps to necrosis. But if it were wedged high in the nostril, and resisted every attempt at extraction, it might be advisable to dislodge it into the pharynx. If, after the interference, the child can blow down that nostril, the obstruction has evidently been displaced.

Ozena (os. to smell).—An ill-smelling discharge from the nostrils may be the result of traumatic, syphilitic (page 68), or strumous (page 37) ulceration; or it may be caused by the irritation of a foreign body. In every case a complete examination should be made with speculum and probe, and before using the former the nostrils should be thoroughly cleaned. Frequent irrigations of warm water and similar, and insufflations of iodoform, will afford much relief in the former conditions, and the constitutional remedies will be of the utmost importance. Chronic catarrh may be treated on similar principles, and, in addition, an astringent powder may be blown up occasionally. In using the irrigator, the fluid thrown up one nostril

should flow out by the other, the child breathing by the open mouth; the palatopharyngeal and the soft palate excluding the food from the pharynx and mouth. Some time since a case of so-called strabismic stoma and enlarged cervical glands was under observation, where the trouble was evidently caused by the irritation of sewer gas.* Four children in the family were affected. The source of the foul air was a wide opening in the main drain close by. As soon as any of the ailing children were sent into another part of the country all symptoms disappeared, whilst a relapse occurred on the return home; this happened on several occasions. The house was on the top of a hill, and difficulty had been experienced in properly ventilating the sewer; every now and then an overpowering stench would issue from the grating.

Malignant disease of the nasal fossa is of rare occurrence. A case has recently been under supervision in which the new growth proceeded from the ethmoid bone, encroaching upwards upon the base of the brain, and extending downwards into the nasal fossa. The growth was associated with frequent attacks of epistaxis. It is only in the early days of the disease that operation can be expected to afford relief. (For meningocoele of nasal fossa see page 163).

Mucous polypi should be treated by insufflation of finely powdered alum and tannin, and, if necessary, by evulsion. Operation may be but partially successful, and may need repetition. Thickening of the mucous membrane over the inferior turbinated bone may be mistaken for polypus. But in the former condition the tumour is fixed, non-pedunculated, and usually of a bright red colour. The polypus is greyish, stalked, movable, perhaps seen with difficulty. The projection from the turbinated bone may require removal by scissors. Bernard Pitts tells of a case in

**Lancet*, August 3, 1876.

which a nasal meningocoele (page 165) was unfortunately mistaken for a simple polypus. Nasal polypi are by no means common.

Impacted food.—Food which is being "bolted" may become impacted in the pharynx; the child will choke, when probably the food will be ejected. But if it be so tightly wedged that no reflex act on the child's part can cause its expulsion, a person of sense would thrust in the fingers and try to dislodge it. If, though the laryngeal aperture were not completely plugged, the accident were associated with extreme dyspnoea, and the fingers passed beyond the epiglottis could not detect an impacted mass, a probe should be passed down into the stomach, as it is probable that the trachea is being compressed. The posterior part of the trachea is extremely compressible.

Foreign bodies swallowed.—Parents may conclude that because a small object with which a child had been recently playing is lost to sight, it must have been swallowed. If a careful and thorough search be made of dress, bed, or carpet, anxiety may often be allayed by the discovery of the missing object. I was once called to a child who, as I was ascertained, had swallowed a large jet earring with a tassel fringe. He showed no symptoms of distress, and the earring was eventually discovered hanging to the mother's dress.

Foreign body in œsophagus.—If it be supposed that a foreign body is lodged in the œsophagus, that admirable instrument, known as the chimney-sweep's brush, should be used. It may be oiled and passed gently down to the stomach; then, by a little manipulation at the handle, a disklike network of stiff bristles is made to stand out horizontally. In its ascent it closely sweeps the mucous membrane, and is almost certain to catch and withdraw anything lodged in the canal. A great advantage of this instrument

is, that being very flexible it is not likely to make a false passage. Cooper Forster tells of the end of a pushing having been found in the posterior mediastinum. Such instruments should be carefully inspected and tested before being used.

The traction made by a piece of bone in its descent may give rise to the sensation that the obstruction persists; the withdrawal of the open beak gives assurance to the contrary. Experience with oesophageal forceps and coin catchers is not generally so satisfactory as that with the chimney-sweeper's brush. If an *ovoid* body were tightly jammed in the oesophagus, *oxypharynx* might be required.

For a **foreign body in the stomach**, porridge, pea-soup, or bread-and-milk should be given, after which an emetic may be administered. The surgeon should be ready at hand to perform *trepanotomy*, lest the shifting the position of the body caused a blocking of the larynx. If the object swallowed were a pen-knife, pin, or anything sharp, it had better not be sought by an emetic. If not brought up with vomit no further trial of the method should be undertaken. The hope then would be that it might pass per anum. In the meanwhile the diet should be such as is calculated to form a full pultaceous mass, in which the object might safely descend. Purgatives should not be given; it might even be advisable to delay the action of the bowel by small quantities of opium.

It is surprising how easily, in this way, comparatively large objects may pass through the ileocaecal valve and anus. I have known a very small button-hook, which was fortunately choked at the time, pass per anum without the least discomfort. The gastric juice has no solvent action upon coins and needle-like bodies. The faeces should be carefully searched by breaking them up in a vessel with quantities of water, and then carefully pressing off the fluid part. Sooner or later

the object will be discovered in the sediment at the bottom of the vessel. The child need not know of the continuance of the search.

Mumps is a contagious inflammation of the parotid gland; it is often epidemic, and one attack usually ensures immunity for the future. The sub-maxillary and sublingual glands may be affected as well as the parotid; the face is then much broadened. The infective material is probably conveyed by the breath, and contagion may be spread even before the swelling of the gland has been manifested, and for an indefinite number of days, possibly for some weeks, after its disappearance. If an outbreak occur in a school, many children may be attacked even in spite of the prompt adoption of precautionary isolation; but infants are rarely affected, even in an outbreak.

Pathology.—The inflammation may commence in the gland ducts, or in the connective tissue of the mass; but infiltration of the whole of the substance of the gland soon takes place, and the fibrous tissue around it becomes implicated in the inflammation. Suppuration rarely occurs, and the serous exudation is in time completely absorbed. Hardness, however, may linger for a time, after all other symptoms have cleared away.

Symptoms.—The premonitory symptoms are general malaise, restlessness, headache, chilliness, and even vomiting; after two or three days the swelling occurs. Subsidence may begin after three or four days. The swelling is attended with stiffness rather than pain; the head and neck cannot be turned, mastication and deglutition are difficult, and the child does not care even to talk. The swelling, which is hard and elastic, begins in the hollow between the corner of the jaw and the mastoid process. (In the case of enlargement of a cervical lymphatic gland, and in "face-ache," the swelling would be found lower down,

the (mastoid) hollow being effaced.) The parotid enlargement thus extends some way down the neck and over the masseter muscle. The other parotid gland may likely be attacked. The axillary temperature may be raised four or five degrees, but there is rarely any redness of the skin over the swelling.

The **prognosis** is favourable; the worst that can be feared is the occurrence of glandular abscess or an attack of inflammation of the meninges of the brain; these complications are, however, very rare.

Metastasis to the testicle is an occasional feature of the disease. It is most likely to take place on the disappearance of the enlargement of the parotid gland, and in rare cases the cessation of the orchitis may be the sign for recurrence of the parotid trouble. In females the mamma or ovary may be similarly affected, or oedema of the vulva may appear. But these complications are far less likely to occur in children than in adolescents.

It has been suggested that orchitis may be produced by an extension downwards of the inflammation, through the deep cervical fascia, the plicura, and the peritonæum. The theory is ingenious; but though the cervical fascia may be implicated with the parotitis, pleurisy is an extremely rare association. The probability is that inflammation of the testis, ovary, or mamma is but another local expression of a constitutional affection which shows itself by preference in idiopathic parotitis. If this be so, the theory of "metastasis" must fall to the ground.

Treatment.—On the earliest suspicion of infection the child should be strictly isolated, and if the constitutional disturbance be severe, he had better be kept in bed; certainly he should not be allowed to run about the house or to go out of doors. The diet should consist of milk and soup; ice may be given to suck.

A dose of *gum powder* or *castor oil* may be desirable; an ointment of *belladonna* may be smeared over the painful area, and a pad of cotton-wool secured by means of a soft handkerchief. *Leeches* should be applied only when the inflammation threatens suppuration. The attack having passed off, change of air, and a course of iron and cod-liver oil, or of other tonic, may be desirable.

THE EAR.

(For malformations, see page 167.)

A foreign body in the ear may generally be removed by a pair of fine forceps, provided that it have not passed right down the meatus. But if it be round and smooth, like a pea, and do not offer a hold for the forceps, it is better to have the child at once under the influence of chloroform, and, even at the expense of wounding the integument of the meatus, to get the blade of a cigarette, or a bent wire, behind the foreign body before attempting extraction. It is injudicious to struggle with the child, and so to run the risk of pushing the body farther down, or to try to get it out by syringing if the stream cannot be introduced behind it. Much damage may be done by an unskilled person attempting extraction; thus the body is almost sure to be forced through the narrow part of the meatus. If the syringe be used the earicle should, at the same time, be pulled upwards and backwards so as to facilitate the escape, and the nozzle of the syringe should be applied to the roof of the meatus. If much swelling and inflammation of the soft parts have been caused by irritation from the foreign body, or by unsuccessful attempts at its removal, leeches should be applied in front of the tragus. After the inflammation has subsided, the earrings will easily remove the foreign body; but one should not attempt extraction so long as the slightest tenderness is

present.* A foreign body which has passed through the narrow part of the meatus may lie loose at the bottom of it without causing disturbance, whilst clumsy attempts at removal may destroy the tympanic membrane, and possibly give rise to a fatal otitis and meningitis. When insects crawl into the ear, they are readily killed by a few drops of olive oil.

In **strumous otorrhoea** there is a serous or mucus-purulent discharge from the external meatus. Sometimes the discharge continues for months or even years, and occasionally it is streaked with blood. Often it is associated with an unhealthy condition of the mucous membrane of the pharynx or nares, the disease having spread thence along the Eustachian tube. Possibly the trouble may be started by chronic inflammation in connection with enlarged tonsils.

In every case of otorrhoea the meatus should be examined with a speculum, for which purpose a careful irrigation with warm water, and subsequent drying, may be needed, the child being anaesthetised if expedient. If the discharge be caused by the presence of a foreign body, or polypus, the treatment becomes evident. But if, either with or without rupture of the membrane, the discharge be associated with struma, it may for long defy treatment (page 55). But if the child's health improve he will probably grow out of the disease.

Suppurative otitis is apt to follow on scarlet fever and diphtheria, or it may be the result of a simple acute or chronic otitis, especially in the strumous subject. The membrana tympani has been destroyed, and the meatus is full of offensive pus; this discharge may continue year after year, without apparently much distress of any kind; occasionally, blood is mixed with the pus, and the ossicles may be detached and discharged.

* George Field: "Diseases of the Ear," p. 46. 2nd edit.

Before an abscess has burst, the acute inflammation of the tympanum will be associated with great constitutional disturbance; the face may be flushed, the head thrown back between the shoulders, and, if old enough, the child will complain of "headache," or pain in the ear. In his essay in the "*System of Surgery*," Dally writes: "I may here be allowed to say that I feel confident that the convulsions of children are often due to brain irritation from an inflamed tympanum." The remark is of great importance. The ear does not receive the attention which it deserves in urgent and obscure nervous conditions in childhood.

Treatment.—If examination with the speculum show the membrane reddened and bulging, a sharp-pointed tenotomy knife may be passed down to and through the membrane; if pus escape the symptoms will at once abate. Though puncture of the membrane is not, perhaps, a very desperate procedure, it should not be adopted as a mere speculative measure. If the case be obscure, it will be advisable to put three or four leeches behind the ear, and to cover the pinna with warm bread poultice; a little warm oil, mildly carbolicised, may be dropped down the meatus.

Prognosis in otorrhoea.—Children, with a general supervision, outgrow this disease; but as regards the persistence of hearing on the affected side, nothing definite can be predicated; sometimes, after severe and long-standing otorrhoea the sense is but little affected, whilst in other cases, or after a short attack, total deafness results. This is particularly likely to follow the loss of the ossicles, though, if the stapes remain to block up the opening into the vestibule, hearing may be but little affected. The loss of the malleus and incus alone may not entail serious result. Then, as regards life, on account of the close proximity of the tympanum to the cranial cavity, there is a grave chance of inflammation extending through the thin

ossous plate which separates the middle ear from the dura mater, and of meningitis and cerebrolitis ensuing. Or the diseased area may be a centre from which purulent absorption may take place, death resulting from pyæmia, after the occurrence of convulsions and rigors. In the case of an infant, who was recently admitted into hospital for suppurative arthritis of each elbow joint, post-mortem examination showed that the pyæmic infection which caused death was secondary to a chronic inflammation of the middle ear, with suppurative disease of the temporal bone. Sometimes death occurs rapidly from suppurative otitis, at others the child grows slowly weaker, and sinks from exhaustion.

The **treatment of otorrhœa** divides itself into the adoption of general and local measures. Amongst the former must be reckoned warm clothing, healthy surroundings, an occasional change of air; iron, cod-liver oil, quinine, and good wholesome food. Amongst the local measures will be included frequent syringing of the ear with a warm and very mild solution of Condy's fluid, nitrate, or carbolic acid. The irrigation should be carried out with patience and persistence, and without the expectation of immediate result. A few weeks, or even months, of the treatment may show but little improvement. The syringe should not be used every now and then, but with perfect regularity, as, for instance, after every meal. The meatus should then be dried, and finely-powdered iodoform blown into it from a quill, or by an insufflator.

Post-auricular abscess.—Inflammation may extend backwards from the tympanum in the mastoid bone, and, partially destroying that tissue, show itself as an abscess behind the ear. A softish tumour covered with dusky skin thus appears; it raises the pinna, and thrusts it forward. There may be much pain, headache, and constitutional disturbance.

Treatment.—The swelling should be incised

forthwith, even if formation be not evidenced, and provision should be made for drainage. If the mastoid region appear soft, or carious, the end of a director may be introduced into it, with the hope of ensuring a free outlet for pus. Often such abscess is secondary to **caries or necrosis of the temporal bone**. In one case, which was lately under treatment at the Children's Hospital, the patient was extremely ill until the abscess was evacuated; at the same time the mastoid bone was scraped with a blunt director, and the cavity washed out with corrosive sublimate solution (one in one thousand); rapid extrusion at once set in. In all these cases finely-powdered iodoform will be found of great service in checking offensive odour and in producing a more healthy condition of the parts. Occasionally sloughs of the temporal bone are cut off; and the entire masto-petrous bone may be detached as a sequestrum and yet the child may recover.

CHAPTER XV.

HARVEY.

THE median part of the upper lip is formed by a flap which descends in connection with the fronto-nasal plate, from the front of the cranium; the lateral parts are developed from the coverings of the superior maxillary processes, which, extending forwards, are eventually fused with the descending flap at a short distance from the median line.

If a unilateral arrest of development takes place, a single lacer lip results; if the arrest be symmetrical the cleft is double. The labial cleft is thus to the side of the median line, never in it, as it is in the hare. The cleft may extend into the nostril; or may be

represented by but a faint notch, or depression, at the border of the lip. Sometimes a small triangular gap is found continuous by its apex with a vertical linear



Fig. 21.—Single Harelip.

scaratrix, as if nature herself had attempted a plastic operation, with partial success. Harelip may be hereditary, several members of the same family being disfigured by it. Often it is associated with cleft palate, and the median piece of the lip may be attached with the intermaxillary bone to the projecting nasal septum.

The proper age for operating.

—The child should be in the best state of health, and in the most favorable surroundings. If the cleft be slight, and



Fig. 23.—Single Harelip, with Cleft of Hard Palate. (After Mason.)



Fig. 22.—Double Harelip, with complete Palatine Fissure. (After Mason.)

do not materially interfere with sucking, the operation may be conveniently deferred until after the child is weaned. When unassociated with defective roof of mouth the child will be enabled to take the breast on its being closed; in such cases the operation may be undertaken with advantage within even a few days of birth.

Possibly, at this very tender age the risk of the patient suffering from the effects of hæmorrhage or shock are greater; but for the sake both of mother and child, the defect should be remedied within the first few weeks if the general condition appear satisfactory. If, however, defective palate co-exist, the operation may be deferred for weeks or months, as the power of sucking could not be improved; strength will be gained by the delay. It is highly important to afford the infant the power of feeding from the mother's breast.

If the palate be cleft, or if, for some other reason, the operation be deferred, unusual care will be required for proper nourishment. Infants thus affected are often so thin and miserable that the surgeon is compelled to postpone the operation, so that the physical condition may be improved. After the lip has been operated upon, the width of the palatine cleft begins to diminish.

When the child cannot suck, the mother's milk should be drawn by a breast pump, and administered in a warm spoon. But if this cannot be done, fresh cow's milk and water (page 8) must be substituted. For feeding, the infant should be held upright, so that the fluid may run easily into the pharynx. If he be sick, it is probable that he is being over-fed, or food is given in too large quantities, and, perhaps, at too long intervals; or, may be, the cow's milk is not sufficiently diluted; but a hasty recourse to condensed milk and the patent foods should not be adopted. He should be covered in flannel, and his body and limbs rubbed after the morning and evening warm bath with cod-liver oil. The nurse who can produce a well-nourished infant with hare-lip and cleft palate deserves high praise; many such infants perish from sickness, diarrhoea, and exhaustion.

Operation for simple hare-lip.—The upper part of the infant's body should be surrounded with a

towel so that the eyes may be secured. Chloroform should certainly be administered. In private houses a low chest of drawers forms an excellent operating table. This should be brought up to the window for the sake of the light. The operator will find it convenient to stand behind the head of the patient, having the chloroformist at his left hand and the assistant at the right.

The first step consists in incising superficially the mucous membrane where it is reflected from the back of the lip into the gum, and then tearing it up with the handle of the scalpel, so as thoroughly to free the lip of its attachments far out on each side of the fissure. From one side of the fissure the mucous membrane is dissected off from the nostril well out on to what should be the proper border of the lip. This is done by transfixing with a thin narrow-bladed knife, of the size of that used for tenotomy, and with the help of a delicate pair of forceps this slip is to be completely detached. The assistant should have compressed the coronary artery between his finger and thumb; it is lying immediately beneath the mucous membrane.

From the other side of the cleft the mucous membrane is liberally raised by transfixing the lip well above the line of the mucous membrane. This second flap is not to be detached, but is to be brought across the middle line, and its raw surface applied to the vertical edge already prepared upon the other side of the cleft, any redundancy being removed after the sutures have been applied. That side of the lip should be chosen for this flap which seems best adapted for supplying a symmetrical and adequate prolabium.

If the sides of the lip be well compressed but little blood is lost, but if the assistant cannot be relied upon for compression, a substitute may be found in a pair of ring forceps, the handles of which are kept firmly together by a small indiarubber band, the outer end of

the lip being gently but firmly nipped between the blades; or the divided end of the coronary artery may be caught, and held in a slender pair of tooth-pressure forceps. The finger and thumb of a dexterous assistant are better than any mechanical arrangement. The assistant will take charge of the right side of the lip, the chloroformist looking after the other side. The hard-lip pin prevents bleeding when compression is terminated. During the progress of the operation blood is kept from flowing into the mouth by the use of tow sponge. The pieces should not get adrift into the mouth.

When the borders of the cleft are duly prepared,



FIG. 26.—Preparation of Labial Flap.



FIG. 27.—Flap Sutured.

a fine steel pin is thrust well into the substance of the lip, at a third of an inch from the edge of the cleft, brought across the fissure, and made to transfix the other side at a corresponding depth. The pin reaches the substance of the mucous lining of the lip, and secures the coronary artery. A piece of thick silk having been twisted round the pin, the edges are kept approximated whilst the sutures are inserted. The sutures are of fine silver wire, or horse-hair softened in warm water. They should be used liberally, and especially so near the border of the lip. The lip should be carefully everted so that some sutures may be inserted in the posterior aspect. These last sutures are important; they keep the depth of the wound free from the irritation of saliva and food. A second pin may be inserted half-way between the first one and

the nostrils. When the last suture is introduced, a clean piece of twist may be adjusted over the pin, and drawn tightly enough just to steady, not to strangle, the included tissue. The pin is to be cut short with champagne nippers, and a little chip of lint tucked under the ends, so as to prevent their being driven into the skin when the strapping is applied over them. A piece of lint may be arranged under the strapping, along the line of the incision. The use of collodion is not necessary.

The face being washed and dried, the cheeks are drawn well towards the middle line, and a piece of Senbury and Johnson's adhesive rubber plaster, cut somewhat in the shape of a canoe-paddle, made to fix the lips, so that there may be no strain on the sutures. The strapping is very narrow over the lip, so that the pin can be drawn out without disturbing it. The pin should not be left in more than twenty-four hours, lest its site be marked by a permanent scar. Before drawing it out it should be loosened by rotation with the forceps, the lip being steadied with two fingers. The withdrawal of the pin is best accomplished by the use of a pair of necrosis forceps.

On the third day the excreted dressings may be carefully sponged off, and sutures which have done their work removed, the cheeks being kept well drawn forward until the fresh strapping is applied. If primary union do not take place, more the less care must be given to keep the granulating edges in close contact, attention being paid at the same time to the general state of health. Union by granulation may give most excellent results. Idle granulations may be gently stimulated. If union take place by first intention the child may be put to the breast on the fifth or sixth day after operation, not earlier, lest the slender flap which has been brought along the margin of the lip be disturbed. The mother should keep up

the supply of breast milk until the infant can take it naturally.

Appreciation.—The advantage of operating by a transposed flap is the avoidance of the notch so often found after the old operation; instead of the notch a natural fulness may be thus obtained. The scar also is less recognisable when thus deflected. The mucous membrane must be carefully adjusted; a satisfactory result may be attained by an unevenness in the red line (Fig. 36). A slight secondary operation at a later period may be needed to give a finishing touch. In paring or adjusting, the border line of skin and membrane must be carefully followed, as it is very possible to remove too little membrane.



Fig. 36.—Dissection and Adjustment of Mucous Membrane.

If double hare-lip be uncomplicated with intermaxillary prominence, the mucous membrane must be dissected from the entire circumference of the median flap, as well as from the opposed borders of the lip; but from one side, or even from both sides of the lip, the detached membrane may be borrowed for deflection across the middle line. This is an important economy of tissue, only that which is found superfluous on adjusting the vivified surfaces being cut away, thus natural fulness of the lip is preserved. Two steel pins may be used, one or both of them being passed through the median flap; they should be withdrawn after twenty-four hours.



Fig. 37.—Double Hare-Lip in Process of Operation.

Hare-Lip may be complicated by **projection of the intermaxillary bone**. The number of incisor teeth eventually to be developed from this

projection may be two, three, or four, often only the central incisors. If the intermaxillary bone be associated with single cleft it will probably contain three incisors. With double hare-lip the projection may prejudice satisfactory result. The question arises as to what shall be done with it. In some cases it will be well to remove the intermaxillary bone rather than to force it back and cover it in; but this is the exception. Holmes justly remarks, that if it be very far forward and out of proportion, and the child be weak, the bone must be sacrificed; but its covering may be utilised, the skin being brought down to form perhaps a nostril septum. It may be urged that if the bone be pushed back the central incisors will grow irregularly; but if the dentist cannot then improve their position, he may extract them. Sometimes the sides of the process may require trimming before it can be pushed into the cleft, in which case the adjacent sides of the cleft should be carefully vivified as well. If it be taken away the incisor teeth are sacrificed, the mouth is made small, the new upper lip hangs flat and depressed, and a mass of tissue, which would be very serviceable in the subsequent closure of the cleft palate, is lost.

The rule should be to try and save the intermaxillary bone. If it be not very prominent the lip may be operated upon without loss of the bone; constant pressure of the lip will cause its gradual recession. When the bone is attached on one side it may be pushed back by the thumb, or twisted back by sequestrum forceps, the blades of which have been wrapped round with lint, so as to diminish the bruising. The lip may be operated upon on that or a subsequent occasion. If the bone be free on each side, but firmly attached to the septum, it may be forced into its proper position after the removal of a wedge-shaped piece from the bony septum, by means of

scoopers or sucking-borers. If hæmorrhage follow, it is certainly advisable that the rest of the operation be not undertaken until after some days, by which time there will have been recovery from the shock. The cautery at a dull heat may arrest the bleeding.

CHAPTER XVI.

CLEFT PALATE.

THE roof of the mouth is formed from fusion of the palatine processes with each other (and with the descending nasal septum) in the middle line. The natural developmental cleft is in the exact median line; but at the front it extends forward on each side of the intermaxillary bone. Double hare-lip is almost invariably associated with cleft palate. The cleft may implicate the roof of the mouth from behind the central incisors even down to the tip of the uvula. Sometimes the uvula alone is fissured, or the defect may extend forward from it into the soft palate, or into the back of the hard palate; or with a single or double hare-lip the cleft may be confined to one border of the intermaxillary bone. If only the soft palate be cleft the power of sucking will be limited, and the spoon will be required to ensure sufficient supplies. Sometimes, with the help of a large hollow indiarubber teat, the child with defective hard palate may be able to suck fairly well. An infant may be brought for advice because, although it takes the breast greedily, it is growing daily thinner. On examining the back of the mouth a cleft may be discovered, implicating the soft palate and uvula.

At first much of the food passes out through the nose; but if attention be paid to the position given

during the feeding (page 213), and as the muscles of deglutition grow accustomed to the defect, improvement takes place. The voice is peculiar and unpleasant; if the child grow up with the defect unrelieved, speech is only partially intelligible, the letter *s* being altogether unpronounceable. Even after the cleft has been closed, if the operation be performed late in childhood, the intonation is but slowly and partially improved; it is, therefore, advisable to operate at as early a date as possible.

The age for operation is in the third year; formerly it was considered advisable to postpone interference until puberty, so that the patient might assist the surgeon by clearing the throat of blood and mucus, but with the systematic use of chloroform this is altered. By the ingenuity of Thomas Smith, the operation for cleft palate has been greatly simplified.

Cleft palate has been successfully operated on within the first year, but at so tender an age tissues are soft and flaps apt to tear across; moreover, the shock occasioned by interference and loss of blood may prove fatal. Till the child begins to try to talk but little can be gained by the attempted closure. Carious teeth should have been extracted some time previously. At the time of operation the child should be in the best of health, and before the operation his temperature should be taken as a precaution.

The operation is long and tedious. Chloroformists and assistants should be well up to their work. An assistant, or skilled nurse, at the back of the head will be wanted for the charge of the gag; the chief assistant will stand on the left of the patient, opposite the operator, and be ready with instruments. A nurse will make herself responsible for clean sponges, some of which are firmly secured on holders, some in scraps. Selections from "sponge clippings" as supplied from the shops are useful; they should be

fresh for every operation. Bleeding during the progress of the operation can generally be controlled by the firm and judicious pressure of a piece of sponge. The instruments are on a table at the operator's right hand. In private houses the top of a low chest of drawers serves for table excellently; it should be brought to a good light. The mattress should be firm, and an inflated india-rubber pillow should securely support the head; as the operation proceeds the pillow may be made fuller or flatter as is desired; when working behind the incisor teeth air may be let out.

For cleft of soft palate.—The half of the uvula is caught in toothed forceps and transfixed by a long, fine-bladed knife, and the mucous membrane liberally pared along the cleft and round to the very tip of the other half of the uvula. If possible, this double strip of membrane should be removed before the sponge is applied, so that the secretion of mucus be not stimulated. A wire suture may then be introduced through the halves of the soft palate, and twisted up, but not cut short for the present. Then a slight pause may be made, if advisable, whilst a soft sponge is pressed up into the cleft to check the bleeding, and whilst iodo-chloroform is being administered. Then more fine wire sutures are inserted down to the very tip of the uvula, twisted up, and cut short. So the soft palate is closed up; but if the fingers be gently pressed against it, it will be found so tight that the sutures would actually cut their way out unless the tension be eased before the child is put to bed. If it be thought inexpedient to twist up any individual suture, lest the strain put upon it be too great, it may be left for the present and tightened up by the torsion forceps after the tension has been relieved. (See next page.)

For cleft of the **hard palate** the edges of the gap are pared as described above, and an incision is then made free before backwards along the inner

border of the alveolar process so as to define the outer margin of an oblong flap of mucopericosteum which is to be detached by the use of the angular knife and raspatory, and sluffed inward. The lines of these incisions are dotted out on Fig. 32.

The posterior part of the flaps and the front of the halves of the soft palate will be freely separated by working backwards through the cleft between the

bone and pericosteum with the blades of a small pair of scissors much curved upon the flat, and by dividing with them the aponeurosis which spreads from the soft palate into the under surface of the hard.

The flaps are stitched together as was done with the soft palate, and the operation is complete, with the exception of the making a longitudinal cut through the substance of the posterior part of the soft palate parallel with and on either side of the median line. These incisions are best made with a sharp tenotomy knife; they are



Fig. 32.—Dissection of soft palate sutured.

carefully divided those fibres of the levator and of the tensor palati and of the palato-pharyngeus, which by their contraction would have interfered with the union of the apposed edges. Sometimes the tension in the front of the soft palate may be eased by continuing backwards the lines dotted out on Fig. 32. At other times separate incisions may be made with the tenotomy knife, freely enough to take off all tension. They do not cause the flaps to slough, but are quickly filled up with granulation tissue. Much will depend upon the thoroughness with which these incisions are made.

The operation for complete cleft need not be divided into two stages, the soft and hard palate may

be treated at the same time. Indeed, to close a cleft in the soft palate it is generally necessary to interfere with the musculo-periosteum and the spongyosa at the back of the hard palate.

Sometimes the success of the operation is partial; a common site for the failure of union is at the junction of hard and soft palate, but such apertures may be completely filled up by granulation, or they may be obliterated by the subsequent growth of the bone and soft parts.

One girl was operated on three or four times, with only a partial success on each occasion; her very wide palatine cleft was ultimately obliterated by chiselling through the palatine arch, and by working the pieces in towards the middle line. The operation of cutting the bone should be resorted to only in those cases in which the coverings are unusually thin or their edges far apart. These flaps of bone and membrane may be secured together by passing a large wire suture around them by means of an anastomosis needle.

When there is difficulty in detaching the musculo-periosteum from behind the incisor teeth, a very small angular knife and a well-curved raspatory will be found of great service; and whilst the friable edges are being stitched together the double hook will be used instead of forceps (Fig. 23). Horse-hair softened in warm water may be used for suturing, and may be introduced by a fine rectangular needle.

After-treatment.—Night and day for a time the child must be watched, or his hands tied lest he get his fingers or toys into his mouth. If his arms be run through a stiff tubular splint, so as to prevent his getting up his hands, he will not need such constant supervision; but he must be thoroughly nursed and



Fig. 22.
The Force
the Hook.

petted when awake to keep him from crying or screaming. On no account must he be allowed to talk; every wish, so far as is possible, must be anticipated. If old enough he can make his wants known by the slate. Toys and picture books will help to while away the time, and if the child be good and the weather fine he need not be kept in bed or indoors for many days.

Soon after being put to bed he may vomit the blood swallowed during the operation, after which he will be quieter; the sooner the sickness is over the better. For some hours he should take nothing but a little ice-water, which is carefully poured into the mouth by a spoon; for some days subsequently all food should be fluid; later on he may have jelly and soft pudding, or a little finely pounded meat or potato moistened with gravy.

The result of the operation should not be inspected until seven days have elapsed, by the end of which time the child will have regained confidence. All the stitches may be left to work their own way out; I have found them harmlessly embedded in the mucous membrane at the end of a year.

CHAPTER XVII.

FOREIGN BODY IN NOSE-PIPE—SCALD OF PALATE.

By a natural instinct little children put everything up to or into the mouth. In the latter case a small body, such as a bead, button, coin, or seed, may be carried with the inspired air, and "go the wrong way." Or, from careless feeding, small bones or fruit stones may enter the larynx. The substance may be lodged in the larynx, or it may pass into the trachea or oesophagus.

of the bronchi, more likely the right, as it is the larger.

If it be lodged in the larynx, spasmodic coughing is at once set up, and this may have the effect of causing its expulsion. The spasm is due to peripheral irritation of sensory nerve filaments, but at periods the respiration is perfectly easy. If the body remains, the coughing continues, and, inflammation attacking the mucous membrane, respiration becomes difficult and insufficient. There may be evident tenderness at the thyroid region. The dyspnoea is paroxysmal, and the child clutches at its throat and stuffs his fingers into his mouth. The voice is altered, and the face becomes red and dusky, the veins swell up, perspiration is profuse, and exhaustion advances.

The laryngoscope affords no practical information. The child resents the introduction of the mirror, and if, with the help of chloroform, an inspection be made, nothing, probably, is seen but swollen tissues and frothy mucus. The history of the case and the suddenness of the attack suffice for the diagnosis; and possibly the child shows by signs what has happened, or states clearly that he has swallowed something with which he was playing just before the attack came on.

Treatment.—A thorough digital exploration of the upper opening of the larynx is made; and, this failing, the administration of an emetic (sulphate of zinc) may procure the liberation and ejection of the body. If this also fail, the child must be inverted and roughly shaken, and slapped between the shoulders, whilst being held in the inverted position. (In case of the glottis becoming blocked during the process, tracheotomy would be demanded; so that preparations for the operation must be made beforehand.)

If the symptoms increase in severity, the probability of the child dying in one of the attacks of dyspnoea is great; tracheotomy must therefore be

performed forthwith; and after the operation, the larynx may be probed from below, the tube (if one have been temporarily introduced) being removed for the purpose. Or a wire and beistle pipe-stem cleaner may be passed up between the vocal cords, under the pilotage of a filiform catheter. If necessary, the inversion and shakings are again to be gone through, the larynx being explored from below.

If the conviction be strong that the foreign substance remains in the larynx, the incision must be continued in the median line, through the cricoid and thyroid cartilages, the side of the thyroid being held asunder, and the interior examined.

If a foreign body have passed *into the trachea*, or bronchus, it will probably be driven up to the glottis from time to time with expiration, when it will cause spasmodic expiration and coughing. The child may be sensible of the body being moved in the trachea; or with the stethoscope its movements may be ascertained by the surgeon. The voice will not be altered as would be the case if the body were impacted in the larynx. If the bronchus or one of its divisions be plugged, the corresponding lung tissue will be collapsed or indurated; at any rate the stethoscope placed over it may convey no murmur of tidal air; or the air may pass the obstruction with a peculiar whistle.

An opening in the trachea is demanded; it should be made as extensive as possible, so as to facilitate the escape of the expiration.

Whatever the position of the foreign body, whether in larynx or trachea, tracheotomy, high up, is the operation required. Low operations upon the trachea are difficult and dangerous. After operation artificial respiration may be required. This is best accomplished by slow and rhythmical compression of the elastic chest walls.

The edges of the tracheal wound may be drawn

apart by the self-holding forceps, and the child should be laid prone with the head hanging over the edge of the table, and sudden pressure may be made over the back of the chest synchronous with expiration.

Possibly when the opening in the trachea is small, the substance will be expelled with blood and mucus in a violent fit of coughing.

If these manœuvres do not succeed, a piece of stiffish copper wire, bent near the closed end, should be passed down, in the hope of mowing and withdrawing the substance, or with the idea of setting it free either by actual disturbance or by coughing. If every attempt fail, the edges of the tracheal wound may be kept permanently apart by a couple of long sutures passed through each side, the child being encouraged to lie prone; on subsequent occasions renewed efforts may be undertaken. A tube must not be worn, or the substance would have little chance of escaping.

If, in spite of attempts at extraction, the body remain, obstructing the bronchus, the surgeon will reluctantly abstain from further interference, and the tracheal wound must be allowed to close. Mucus, blood, or pus, may be expectorated; and possibly after days, months, or years, the substance may be expelled through the larynx in a fit of coughing. Its presence may, however, cause abscess in a part of the lung, or give rise to fatal hæmorrhage or septicæmia. Or an attack of pleuro-pneumonia being associated with localised abscess, the substance may escape through an intercostal space. In the museum of the Children's Hospital is the preparation of a lung which was ruined by the permanent lodgment of a foreign body in one of the bronchial tubes.

Scald of fauces.—A common childish trick is to put the mouth to the spout of a teapot, or of a kettle upon the fire, and suck. If the mouthful of fluid thus drawn up be very hot, acute inflammation

and oedema at once come on, with pain and dyspnoea; the symptoms appear with great suddenness, and may follow on the drawing in of the air with inspiration, as may happen when a child's clothes catch fire. Oedema extends to the level of the vocal cords, but not below them.

In the adult such a pathological condition would be dealt with by the simpler operation of laryngotomy, but in the child there is not sufficient room in the crico-thyroid space for the admission of a tube; the trachea is therefore opened.

Treatment.—The room and the cot for the child with scalded throat will be arranged as in the case of tracheotomy, page 43. Except when there has been a severe burn the prognosis of these cases is favourable; the child, however, may die from shock or from secondary lung complications. The hot sponge, or leeches, may be applied, and two grains of calomel given every hour until a definite effect is produced, and two minims of antiseptic wine with half a minim of tincture of aconite may be given every fifteen or twenty minutes, as suggested by Durlum.

Holmes advises that in the case of burn or scald of the larynx too hurried a recourse be not had to tracheotomy, as much of the dyspnoea may be due to simple reflex irritation which may be allayed by treatment. When, however, the dyspnoea is extreme it would not be safe to leave the child without having performed tracheotomy. Too much reliance should not be placed in scarification of the membrane; indeed, how could one be sure of scarifying the swelling over the rim without doing serious damage to the cords?

In a case of severe scald of the throat H. D. Palmer* administered frequent doses of cod-liver oil and lime-water, as much for the sake of a dressing to

* *The Practitioner*, April, 1885.

the inflamed membrane as for the nourishment this "Carrot oil mixture" would afford. The suggestion is a practical one.

CHAPTER XVIII.

SPINA BIFIDA.

A *VERTEBRA* has three primary centres of ossification, two for laminae and one for body. The laminae are fused in the root of the spinous process. If development be arrested the spinal canal remains unclosed posteriorly, the membranes with the cerebro-spinal fluid protruding as a soft tumour. This pathological condition is termed *spina bifida*; it is found most often in the low lumbar and sacral region, for there the laminae are last solidified. It is possibly caused by an increase in the amount of cerebro-spinal (sub-arachnoid) fluid in the early development, whereby development is prevented; thus it is often associated with hydrocephalus.

The tumour may be so large at birth as to mislead the obstetrician as to the true nature of the presentation.* The most characteristic feature of the tumour is its exact median situation, and its firm attachment to the deep parts; it is rounded, but if a number of neural arches be undeveloped the base will be elongated in the axis of the column. When not over-distended, striated ridges of bone may be felt on either side of its root.

Though the membranes are fused with the skin, the wall of the tumour may be thin, translucent, and threatening rupture. Sometimes it yields spontaneously, the sub-arachnoid fluid escaping; or the wall may be but a thin membrane, through which

* *Wm. Cox; Brit. Med. Journ., 1888.*

the fluid comes or quickly escapes by absorption. The wound may then close and the sac may refill and burst again, each escape of fluid being associated with convulsions. Eventually such a case may end in spontaneous cure, but far more probably in death.

At other times the skin is thick, leathery, and wrinkled; translucence and fluctuation being absent. Often the deformity is associated with imperfect innervation of pelvic viscera, with arrested development of the lower extremities, or with club foot. Whether the collection of serous fluid is the cause or the result of the spine bifida has not yet been absolutely determined.

When the child screams, some of the cerebral fluid is displaced from the interior of the skull and into the spinal canal, the tumour becoming more tense; and by gentle compression of the tumour some of the fluid can be squeezed into the cerebro-spinal canal with the effect of causing irregular muscular movements or even convulsions.

Sometimes the sac contains no nerve cords or branches; at others the nerves are spread over its inner surface. In rare instances the sac is lined by the substance of the cord itself, the serous fluid being contained in the immensely dilated central canal of the cord. This is likely to be associated with the internal hydrocephalus. If the cord or the large nerves of the *corda equina* be in the sac, they will occupy the median part.

The cases most amenable to treatment, or likely to undergo spontaneous obliteration, are those in which only a narrow communication exists with the spinal canal. The more slender the pedicle the less the probability of the sac containing nerve element. Collodion may be painted over it with the view of compression. The first step to obliteration, either by nature or art, is the closure of the neck of the sac. If no operation

be contemplated, protection should be afforded to the cyst by a moulded cap of gutta-percha or leather; even after operation such a shield may be desirable. If the base of the tumour be large (and the communication with the spinal canal probably free), and the covering very thin; or if a tumour be associated with hydrocephalus, talipes, paralysis, arrest of development, or other congenital malformation, it is best that the spina bifida be left alone. Heretofore treatment would bring discredit on the art, and disappointment to all concerned. For the first few months from birth no active treatment need be undertaken; an opportunity should be given for the tumour to undergo spontaneous cure. But if after judicious delay the tumour undergo no change for the better, if the pedicle be small, and there be no association with other defecta, treatment may be undertaken, lest that with a full appreciation of the grave risks attending it.

Morton's method consists in the injection into the sac of a drachm of a preparation of ten grains of iodine and thirty of iodide of potassium in an ounce of glycerine. About a drachm of the fluid of the sac is first withdrawn, so that the tension may not be increased by the injection. The communication with the spinal canal may be shut off during the administration of the injection.

A hypodermic syringe may be used, the puncture of the sac being made towards the side, so as to diminish the risk of wounding the cord or the large nerves. The advantage attending the use of this preparation is that, being heavier than the cerebro-spinal fluid, it is not diffused along the spinal canal, but sinks to the bottom of the sac, and there quietly, or with local excitement, produces a change in the tissues. If the child survive, the injection may have to be repeated. If it were known that the sac contained neither cord nor nerve (unfortunately this information

can rarely be obtained), a careful plastic operation might be attempted with antiseptic precaution, the edges of the sac being adjusted with fine suture. But convulsions and meningitis might follow on the disturbance of the sac.

Morson advises* that operation be undertaken when the infant is from three to six weeks old, for the tumour is apt to grow. The smaller it is for operation the better. The injection should be obliquely into the tumour and through healthy skin.

Mayo Robson has described† four cases in which he exposed the tumour under the coccygeus spray, and approximated the cutaneous and meningeal flaps respectively by suture. In the first case the infant lived a year; in the second death followed from marasmus, the wound having healed by primary union. In the other two cases an excellent result was obtained. He divides cases of spina bifida into three classes: first, those in which no operation could be done; second, those in which it need not be done; and third, those where it should be done. The first class does not seem to be so large as it was formerly thought to be. The third class comprises, amongst others, those tumours which communicate with the spinal canal by a small opening; and those with a large communication but with abundant and serviceable skin. Should the sac be found to contain nerve elements, portions of the cyst wall might be removed from between the nerves, and the collapsed sac be placed in the spinal canal and covered with skin. Possibly the gap in the lamina might be satisfactorily dealt with by the transplantation of peritoneum removed from a recently aspiated fish. Robson's results may be considered satisfactory, but had the cord and the nerves been extensively implicated in the sac, as happens in the majority of

* *Medical Times*, June 6, 1883.

† *British Medical Journal*, April 6, 1883.

cases, such gratifying reports could scarcely have been shown. Methods somewhat similar may possibly have been tried at various times, and the results having been unsatisfactory, no publication of them has been made; the subjects of speculative and unsuccessful operations usually have quiet, uncontested sepulture. Robson's successes will probably stimulate surgical interest in these cases, and it would be well for our art if all the results, whether failures or successes, could be reported in due course.

The **prognosis** is extremely unfavourable. Pressure against, or injury to the sac may cause ulceration or sloughing, when, the fluid escaping, death quickly supervenes, with convulsions; or spinal meningitis, myelitis, and softening may complete the history.

The more contingency frequently follows treatment of the sac by aspiration, puncture, ligature, or excision. On the obliteration of a spina bifida, hydrocephalus may ensue. One has seen several cases in which a gradual shrivelling of the sac, and its eventual obliteration, have taken place spontaneously.

In the cemetery of St. Mary's Hospital there is a large spina bifida, which was removed from the body of a man who died at the age of twenty-nine years.

By **false spina bifida** is meant a tumour which, taking its root within the spinal canal, escaping through the undlosed lamine, and appearing over the line of the spinous process, does not contain either spinal nerves or cerebro-spinal fluid. The nature of such tumours varies; perhaps the most common example is the shrivelled and wall of a true spina bifida, which has undergone obliteration. (See also page 117.) In one instance the tumour was associated with deficient innervation of the bladder; the man had the appearance of a simple, subcutaneous fibro-fatty growth, and almost invited surgical interference. No operation was, however, undertaken. Probably the tumour was

deficient, but this could not be ascertained; the association with "weakness" of the bladder evidenced deep attachment. In proposing operation for a false spina bifida, the surgeon should assure himself, as far as possible, that its connections with the interior of the spinal canal, and with the interior of the pelvis, be not such as to preclude complete ablation (Holmes). Digital exploration by the rectum should be performed.

CHAPTER XIX.

THE SPINE.

It is unoriginal to speak of *spinal curvature* as a separate disease; it is but a symptom of disease, and may be associated with various pathological conditions. It may be due to general softness of the vertebrae, so that the column yields under the superimposed weight; thus it is found in the rickety child, or in the girl outgrowing her strength; but it is generally the result of vertebral caries. The differential diagnosis is found on page 238.

Vertebral caries, or Pott's disease of the spine, is a rarefying osteitis, beginning in, and sometimes confined to the body of a single vertebra; more frequently it spreads to the adjoining fibro-cartilages, and into a long series of vertebrae. The disease rarely begins in an intervertebral disc.

Sometimes the bodies of vertebrae in distant regions of the column are affected, whilst the intervening segments are apparently sound. Thus, in the same subject, the upper cervical and the lower dorsal vertebrae, or the cervical and lumbar regions, may be diseased. The caries may co-exist with disease of the hip or of some

other articulation, with enlarged lymphatic glands, or with disease of the hand, foot, or ear of the long bones. Often it follows scarlet fever or whooping cough.

Vertebral caries is generally traceable to injury, such as a fall down stairs, from the bed, perambulator, or the nurse's arms. But at times a child who is apparently in robust health, and who has met with no particular injury, is attacked. No child is too young to be the subject of vertebral caries.

As the disintegrating inflammation advances, the bodies of the vertebrae undergo absorption, whilst consolidating deposits of new bone may be taking place about the laminae and articular processes. By these deposits the parts behind the spinal canal are converted into an admirable prop for the weakened column. But for this plastic deposit, what is left of the carious vertebra would fall together, with the probable result of compression of the cord. Let those who would talk of straightening out a carious angle of spine ponder over this mechanical arrangement.

From the gradual sinking together of the diseased segments, and the throwing out of the cement about the laminae, the spine is bent and stiffened; nevertheless, the cord escapes compression, unless the angular deformity be extreme, or the disease have advanced so rapidly that the cord has not had time to adapt itself to the altering circumstances. In such unfavourable circumstances compression may exist with but slight deformity.

If the disease be advancing towards recovery, bony mortar is deposited in the carious angle, and the adjacent vertebrae are welded into a solid, unyielding mass. Sometimes distant vertebrae thus become approximated; Mr. Cooper-Powson instances the third or fourth dorsal vertebra as ankylosed to the eleventh.

It is by ankylosis that nature is able to effect a cure; all that the surgeon can do in assisting is to

keep the child in the best possible health, and to ensure absolute rest for the diseased segments.

Disintegration of the vertebrae is frequently associated with the formation of abscess, but in certain quiet cases the debris is absorbed by the capillaries and lymphatics as quickly as it is formed, so that no definite abscess occurs; this condition constitutes *caries sine*; it is of constant occurrence.

But though abscess have formed, the pus may undergo gradual absorption under the favouring influence of rest. The question of absorption of pus is, perhaps, only one of degree, for though in many cases of spinal caries no pus makes its appearance, still some must have existed, and if a small amount can be absorbed, why not a larger amount?

Sometimes, though abscess threatens, the local disturbance quiets down and no pus appears, while consolidation sets in, even if it be not completely established. But later on, perhaps after injury or illness, the cheesy deposit which was left near the consolidated region becomes once more the seat of active pathological changes, and the suppuration which threatened months or years before makes its unwelcome appearance. This is known as a *residual abscess*; its treatment is that of an ordinary spinal abscess. Sir James Paget* is of opinion that the healing of discharged residual abscesses is quicker and attended with less disturbance than the healing of first abscesses of the same site.

Spinal abscess is a collection of pus in connection with vertebral caries. If inflammation have walled the surrounding tissues into a limiting wall, the abscess will be found close to the diseased segments. Thus pus from cervical caries may form *post-pharyngeal abscess* (page 112); from caries of thoracic vertebrae, *deep abscess*; from disease of the loin vertebrae, *basilar abscess*. Suppuration which remains

* "Clinical Lectures and Essays," p. 300. 2nd ed.

confined to the region in which it was formed, is more amenable to treatment than that associated with infiltration or wandering. In the latter case long sinuses and inaccessible cavities complicate the treatment.

Often the matter is guided by fascial connections into distant regions, there to be confined or discharged. From cervical caries abscess may point in front of or behind the sternomastoid, or pass into the thorax to form a mediastinal abscess, whence it may be discharged into the trachea, bronchia, or œsophagus, or by the base of the scapula.

Pus from dorsal caries finds its way beneath the intercostal serratus ligament into the sheath of the psoas; and psoas abscess from dorsal or lumbar caries may be guided by the attachments of the sheath of the muscle beneath Poupart's ligament and into Scarpa's triangle; rarely will it wander farther down the thigh beneath the fascia lata. A spinal abscess has, on one strange occasion, been traced nearly to the heel.

Spinal abscess may discharge itself into the duodenum, colon, rectum, or any neighbouring piece of intestine, or even into the bladder. Pus from lumbar caries may escape through the great sacro-sciatic notch to form a gluteal abscess; this may point by the lower border of the gluteus maximus. A child was recently seen in whom fistula-in-ano remained after an abscess had broken through the ischio-rectal fossa. Fistula-in-ano from spinal abscess is a rare condition and apt to pass unrecognised. There is, however, a strange suspicious look about the opening, and a probe may be passed through it up towards the spinal column.

An abscess near the spine is not necessarily the result of vertebral caries; if the spine bend freely it certainly is not; but a large chronic abscess in the neck, trunk, or thigh, is very apt to be associated with vertebral caries.

The **diagnosis of caries** is very tough when

angular deformity has been produced; but the surgeon must detect it in those early days when a view of the vertebra themselves could reveal little more than an hyperæmic or slightly inflamed area; it is then that treatment may effect greatest good. Stiffness is one of the earliest signs of spinal osteitis; it occurs on even in the dorsal region long before angular curvature. Caries in the lumbar region is apt to have advanced much farther without recognition than it could have done in the neck or chest. In the lumbosacral region a slight falling together of the bodies of the vertebra is accompanied by so obvious a projection of the spinous processes (which are by nature prominent) that the mother herself notices the back growing out. In the cervical region the stiffness, the distressing pains in the head, neck, or chest, and the propped chin, generally obtain early attention. But when the low dorsal or lumbar vertebra are diseased, and the child is suffering from that constant irritation of the terminal branches of the intercostal and lumbar nerves, which he may designate "belly ache," or which some one else ascribes to rheumatism, lumbago, or sciatica, there may still be no projection in the back. Yet that part of the spine will be rigid and straight, and after a time a spinous process or two may be found standing out a little between the masses of the erector spinae.

The adjacent sketches show that a slight falling together of the front of the cervical or lumbar vertebra must produce a straightening of that part of the column, and not a projection (Fig. 34: a and b).

An early sign of spinal caries is *fatigue*, coming on during play as well as in leisure time. The boy does not care to run about, but complains of feeling tired, and, leaving play, he lays himself down near his mother, or on the sofa or hearth-rug. When standing he supports himself by holding his mother's dress, a chair, or table. He cries as he is taken out of his bath

or lifted from the floor, on account of the disturbance of the inflamed area. When standing, he props himself up by grasping his thighs above the knees.

"*How does he come down stairs?*" If the answer be that he now asks to be carried down, or prefers a leisurely and cautious descent, by the aid of the balusters, putting each foot on every stair, and refusing to jump from the bottom step; and if he complain of pains along the sternum, or at the sides of the

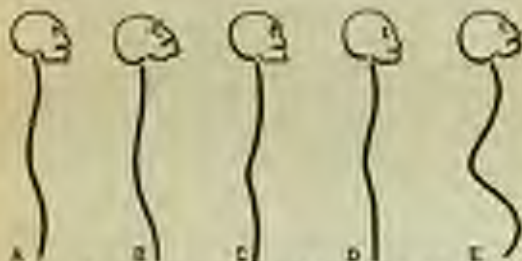


Fig. 36-4. Normal Curves: *b*, Cervical Curves, neck stiff and straight, head thrown back; *c* and *d*, Lower Dorsal Curves, slight protrusion, otherwise back straight; *e*, Advanced Dorsal Curves, marked hump and secondary curvatures.

chest, down the arms, in the abdominal walls or thighs, the diagnosis is clear. When sitting at meals or lessons he will lean forward, and support his chin in his hands, the elbows being planted on the table; and when standing also he may steady the chin with the hand.

Pains.—If the disease be in the cervical region there may be pains, possibly called "headache," over the area of the occipital branches from the second cervical nerve; or in that of the great auricular from the second and third. A little girl suffered constant pain, lasting over the region between the chin and the sternum, which she described as "belly-ache in the

neck ; it arose from pressure upon the trunk of certain nerves as they issued from the diseased region of the column. The third nerve joins in the formation of the transverse superficial cervical nerve which supplies the skin over the front of the neck. She could not bear pressure on the top of the head, nor could she shake or turn it. Little children are not clever at describing symptoms, and a headache "somewhere here" is apt to be the result of irritation of the trunks of high cervical nerves.

If the disease be lower in the neck, pain may be referred to the pectoral or deltoid regions, where the supraclavicular branches are distributed.

If the lowest cervical vertebrae be inflamed the trunks of nerve which enter into the brachial plexus will be liable to compression, pain being referred to shoulders, elbows, or even to the fingers. For pains in such shoulder or such arm, the cervical spine should straightway be examined. And even if obscure pains be not symmetrical, but confined to one side, attention should be directed to the spine.

When the dorsal vertebrae are diseased, neuralgia may be felt in the intercostal nerves, or their peripheral branches. And when any part of the lower half of the dorsal column is affected, pain may be referred to the epigastric or umbilical region, or even to the skin over the ilium, where the lateral cutaneous branch of the last dorsal nerve is distributed.

In a girl of about seven years, who had previously been under a long course of treatment for constant "stomach-ache," dorsal caries was detected. After a series of plaster of Paris jackets the spine became ossiculated, though with deformity. Later on she was found to be the subject of strumous disease of the knee joint; abscess formed and was opened, but she has recovered with a useful knee. Her trouble was of strumous origin.

With **lumbar** disease the pains are referred to the ilio-hypogastric and ilio-inguinal nerves, or the genito-crural or external cutaneous.

If, on being asked where the pain is, the child place the fingers in each groin, or over each hip or each iliac crest, it is almost certain that he has high lumbar curies. Pains in the front of the thighs, that is, over the region of the anterior crural or obturator nerves, direct attention to the neighbourhood of the third and fourth lumbar vertebrae. If it happen that the nerve fibres destined for the long saphenous branch are irritated as they leave the column, pains will be referred to the inner side of the leg or foot, or to the ball of the great toe.

Unfortunately all such pains are often ascribed to rheumatism. Symmetrical pains are the result of central mischief, and generally of spinal disease. (Knee pains may be caused by disease of the sacro-iliac joint, hip-joint, knee-joint, or by pelvic abscess.)

Stiffness of the affected region of the spine is a sign of greater importance than is angular deformity: from first to last in vertebral curies there may be no projection whatever of the spinous processes. In the mid-cervical or lumbar regions the occurrence of an angular projection is hardly to be expected, on account of the backward direction of the convexity of the normal curve. (See Fig. 34.)

When spinal curies has existed for some years, the attitude and expression give evidence of the disease. The face is old and thoughtful beyond the years; the body and limbs are ill-developed; and, judging from size alone, one would be much misled as regards the real age of the little sufferer. Development is checked by long-continued disease; the intellect is often extremely bright, and the patient endurance remarkable. From his being constantly in the company of grown persons, and unable to join in any of the games of

those of his own age, the manners of the child become quaint and matured. It may be said of the many subjects of spinal curvatures that they have no childhood.

In the examination for suspected spinal disease the child should be stripped quite naked. If the weather be cold he should be taken to the hearth-rug. To



Fig. 21. — Early Dorsal Curvature; child cannot bend the back in slumping; and supports weight by hand on knee.

examine the back under the shirt, or to strip him only to the waist, does not suffice for thorough inspection. To percuss or apply a hot sponge along the spine is an inefficient and fallacious test, for a touch over even the soundest part is apt to cause apprehension, and, having set the child crying, to spoil the case for further examination on that occasion. Having required of the mother concerning the peripheral points (page 240), and having taken a glance at the back, the range of movement in the column should be

noted. For this purpose it is well to throw a pen, a coin, or a toy upon the floor, and watch the child pick it up. If he be frightened or obstinate, and refuse to stoop, the end may generally be gained by letting his sock or shirt fall, and telling him to pick it up, so that he may be dressed and taken away.

If the **dorsal** or **lumbar** vertebrae be affected, the spine is so rigidly fixed that the child cannot stoop; he will try to bring the hand to the ground by bending the hips and knees, keeping the spine quite stiff. If the neck be diseased he cannot bend his face towards the floor. He will not be able to turn the head without wheeling round the shoulders, nor will he shake or nod it. Every movement is carried out with caution; the occiput is drawn back and steadied against sudden juts. Thus the neck is shortened, the shoulders being drawn up also, to steady the base of the skull.

If the child be stood upon a chair or footstool, and asked to get down, he will do so with extreme caution, dreading the least shake; he will certainly not be willing to jump down; not that it is advisable to propose so severe a test. The surgeon may stand in front of the child, and, whilst talking to him, gently press down upon the top of the head; or, in the case of suspected dorsal or lumbar disease, upon the shoulders. By watching the facial expression he can at once see if this pressure cause discomfort.

Disease of the occipito-atloid joint.—From severe injury, or under the influence of wet, cold, or constitutional debility, inflammation may attack the synovial membrane of one or both of the condylar joints. A case was recently under treatment in the person of an anxious-looking boy of four years whose chief trouble was pain about the top of the neck, and lower part of the head; he had met with no particular injury; he soon got tired, and was glad to lie down

by his mother. He sat with his head in his hands, and on being asked where "it hurt," pointed behind the right mastoid process. The head was inclined towards the right side.

A similar case is described by M. Potpizel,* in which death suddenly occurred. At the autopsy the odontoid process was found compressing the spinal cord.



FIG. 26.—Synostosis of Atlas and Odontoid, the result of sub-occipital disease.

The prognosis in sub-occipital disease is not necessarily unfavourable, especially if treatment be prompt. The adjoining figure, which is taken from a preparation without recorded history, shows recovery with synostosis after disease of the left condylar joint. Plastic deposit had also joined the left side of the posterior arch of the atlas with the occipital bone for extra strength and steadiness. The occipital bone had sunk back-

ward into the characteristic position.

To obtain a result so favourable as that given above, cervical cancer demands early diagnosis and immediate treatment; unfortunately the first symptoms may be considered rheumatic.

Case.—A schoolboy, of twelve, who was in other respects quite healthy, complained to the doctor who attended the school of pains in the neck; they grew worse under the treatment adopted. He was, therefore, taken home to be under the care of a physician,

* *Société Anatomique de Paris*, Feb. 9, 1882.

who also ascribed the pains, which radiated over the head and neck, to rheumatism. Lastly, a surgeon was called in and cervical caries diagnosed. The boy was then kept flat on his back, with large sand-bags along either side of his head and neck. But motor paralysis in the lower extremities occurred; and one night the diseased vertebra gave way, immediate death being the result.

Post-pharyngeal abscess may be formed insidiously, especially if the disease have escaped recognition, or have not been subjected to thorough treatment. Sometimes pus is formed in the loose connective tissue in front of the carious vertebra even in spite of the adoption of early treatment, especially if the subject be strenuous or delicate. I have never met with a post-pharyngeal abscess which was due to other disease than that of the vertebra; it might occur, however, after acute fever, or in the course of an attack of pyæmia, independently of vertebral caries. There may, at first, be no aggravation in the symptoms of the cervical caries with the formation of abscess, but as the bulging of the pharynx increases "sore throat" may be complained of, and difficulty in swallowing, and even in breathing. There may be also bulging in the neck, most likely behind the angle of the jaw. Solids cannot pass through the narrow spaces, and, if the bulging be great, even fluids may regurgitate. The child runs the risk of suffocation, both from obstruction caused by the swelling, and from the abscess suddenly discharging its contents into the larynx.

Ordinary inspection of the throat may not suffice to detect the abscess; the index finger must be introduced, and made to explore the back of the pharynx. If pus be there a doughy swelling will be detected, or even definite fluctuation may be made out. (For treatment see page 252.)

General signs of spinal abscess may be deep-seated, or peripheral neuralgic pains, which are not necessarily symmetrical in their distribution; there is a tenderness and fulness, as in the iliac fossa, and the surface veins are engorged; the limb may be swollen from pressure of the pus upon venous and lymphatic trunks.

In every case of dorsal or lumbar caries, and particularly so when there are "rheumatic" pains or startings in the thigh and leg, the iliac fossa should be examined for encysted abscess. The child should be naked, and lying with his thighs drawn up; steady pressure should be made with the fingers down into the iliac fossa, beginning the examination on the sound side. Attention should always be distracted by beginning the examination in a part which is free from tenderness. If a child with probable lumbar disease affirm that "it hurts" when the skin of the pectoral region, for instance, is gently pinched, no confidence need be placed in his subsequent statements.

Spontaneous absorption of abscess may occur; but the happy event is rare. *Case.* Lillian G—, six years, came under treatment (in Nov., 1891) for doro-lumbar caries, for which she was kept lying down for nine months, during which time night-shriekings, and pains on movement, disappeared. She was, as her mother said, "ever so much better." A plaster of Paris jacket was applied, which she wore continuously, and with the greatest advantage, for five months, gaining five pounds in weight. The next she wore six months, but on its being taken off the child complained of pains in the area of distribution of many of the cutaneous branches of the right anterior crural nerve, and especially along the inner side of the ball of the great toe. Abscess was detected in the right iliac fossa. Another jacket

was applied, and was worn continuously for fifteen and a half months; on its removal there was not a trace of abscess, the child was free of pain, quite well, and strong. She was ordered a stiff canvas jacket strengthened with strips of whalebone.

The **constitutional treatment** consists in the use of cod-liver oil and steel wine; if a child turn against the oil he had better not be forced to take it, probably the stomach cannot digest it; a teaspoonful may be rubbed into the skin every day. The compound syrup of the phosphate of iron, quinine, sassafras, and soda, the laxative iron mixture, may be prescribed as poisons direct, but it may be well to leave the child now and then without medicine.

The **diet** should be plain, nourishing, and easily digested, consisting for the most part of milk, with now and then some extra cream, milk-puddings, underdone or fat meat and gravy, fruit, and vegetables. The child should not be pampered, and care should be given that the appetite is not cloyed with cakes or sweet stuff. Neither wine nor beer is, as a rule, required, but if exhaustion increase a little may be of service.

The **mechanical treatment** of spinal curves is comprised in one word, *rest*; and speaking generally, this rest will be best obtained by keeping the child flat upon the back upon a firm and narrow horse-hair mattress, on which, in fine weather, he may be carried on a board into the garden, or into a carefully arranged spinal carriage; he should have a thin, firm pillow. He can be washed and dressed by being turned first on one side, then on the other, without being disturbed; some violet powder may be dusted on the skin. The bed must be carefully made. Unfortunately such perfect rest can be rarely obtained. Plaster of Paris jackets, and other forms of support, aim at securing rest whilst the patient goes about, but

this is only the second-best line of treatment, for the rest is best perfect. A child does *not* rest or pine away if kept constantly in the horizontal position. He will *even* like the treatment, when its adoption is the means of ridding him of his pain. After from six months to a year's rest, if he have been going on well, relaxation in the treatment may be gradually allowed.

In the treatment of cervical caries I have



Fig. 37.—Breast-plate and Collar for Cervical or High Dorsal Caries.

given the jury-mast of Dr. Sayre a fair and extensive trial, and have now entirely discarded it. It is heavy and cumbersome, and offers no advantage over the leather cervical collar (Fig. 37) which bears up the chin and occiput. The rotatory movement of the neck, which the jury-mast is constructed to permit, is an absolute disadvantage; rest, and always

rest, is the one indication for treatment in all these cases.

The cervical collar gives relief by ensuring this rest, rather than by lifting up the superimposed weight, as may be inferred from the fact that its influence is equally beneficial in high dorsal caries.

A child was frequently crying on account of pains in the chest; he had also the habit of putting his hand to his head as if in pain; he was growing thin, and his mother had "no peace with him." The neck and shoulders were stiff from caries of or about the second, third, and fourth cervical vertebrae. On being fitted with the "collar" the pains ceased, and he grew fat.

At the end of a year, though still wearing the support, he was in excellent condition.

Probably there is no other way in which caries of the high dorsal vertebrae can be better dealt with. The beneficial influence of a plaster of Paris jacket can hardly extend to a level above that of the *acromia*.

Dr. Fleming has recently introduced* an expanding bag of indiarubber, which is distended, and worn around the neck. The scheme is excellent, but the support afforded by it may be less efficient than that obtained by the cervical collar.

The collar is made by Spruit, of New Bond Street; it is moulded on after the leather has been soaked in a pail of hot water; the hardened cake is afterwards lined with chamois leather, and the front and back halves are made to overlap on the shoulders, and are fixed together by straps and buckles. The material is cow-hide which has not been "dressed," that is, impregnated with oil.

Amongst the advantages of the collar are its lightness, its durability, its easy fit, and the security which it affords, which last is so great that it is not necessary to keep the child always in the horizontal position, though, of course, he must be kept in comparative rest and quiet. I would remark that I lay no claim to the invention of this collar. Such have long been used at the Great Ormond Street Hospital, and probably at other places.

The treatment of dorsal and lumbar caries by absolute rest is not generally obtainable for all poor children. The next best treatment will consist in the use of plaster of Paris jackets, as systematised by Dr. Sayre, or of poroplastic felt corsets.

The plaster of Paris method cannot be satisfactorily carried out without some little practice;

* *Glasgow Medical Journal*, 1884.

but after a few disappointments in the working or wear of a jacket, the causes of the failure are recognised, and the art acquired. After nearly seven years of extensive employment of the plaster jackets, I find myself as firm a believer in their value and necessity as ever. Most of the objections to them exist only in theory; they need not be disturbed for six, eight, twelve, or fifteen months, and I have seen them worn with great benefit for as much as two years without being taken off. The material for the rollers is criminalus waxin, torn into strips about five inches wide, and five or six yards long. The string should be softened by soaking in hot water, in order that, when it has been dried again, the gypsum may be more thoroughly rubbed into its meshes; the gypsum should be fresh, or should, at least, have been kept in a dry place.

A tight-fitting singlet is drawn over the body, and a long thick pad run beneath it along each side of the spinous processes, to prevent chafing. No so-called "dinner pad" need be used, and the plaster should be applied closely and evenly around the trunk from just above the great trochanters to high up in the axilla. There is no necessity for suspension of the child whilst the jacket is being applied. It has been proved excellent practice to have the child standing with the arms held up out of the way. Some prefer to apply the jacket in strips, as the patient is lying down.* But as the jacket is not applied with the idea of straightening the spine, but merely for securing rest, the position adopted matters little. Davy prefers to have the child lying in a hammock during the application.

A certain amount of deformity must be expected to follow even the successful treatment of spinal curvæ; in some cases the amount of deformity is insignificant,

* *British Medical Journal*, 1879. See also *Medical Press and Circular*, Dec. 1894, 1879; and *Journal of Feb. 25th, 1880.*

especially where the treatment has been begun early and carried out thoroughly. Sometimes the resulting deformity is an abnormal straightness, as in the neck or loins; sometimes, as in the dorsal region, it is angular. By "cure" one means a falling together and consolidation of the diseased bodies. If a projection have been formed along the backbone, no treatment can obliterate it. Suspension may diminish the un-sightliness of secondary curves; but the primary curve must be permanent.

It is important that the bandages be quite loosely rolled, so that immediately they are put into water every molecule of the plaster may be straightway wetted. The roller is dipped, not soaked in the water, and should be applied dripping wet; squeezing it dry in the hand causes a loss of the gypsum, as well as of time. The addition of a little common salt to the water hastens the setting. The whole business of applying occupies but five or ten minutes, and a handful of moist sugar in the wash-basin will be found of excellent service in freeing the operator's fingers and nails of adhering plaster.

I find a note in my "Spine-book" to the effect that on one afternoon, with the help of an able Sister, I applied fifteen of these jackets in an hour and a quarter, taking brief notes also of each case; the method, then, does not involve a waste of time.

The plaster of Paris treatment is of equal service in the treatment of cases of the dorsal and lumbar region; when the jacket is on, the child must still be kept very quiet, and as much in the horizontal position as possible, in order that the diseased bones may be in a position of continuous rest. One has had many children attending school in their jackets, after permission for them to do during school hours has been obtained. They should just go to school both morning and afternoon; and Sunday should be to them a day of perfect

rest. By a little ingenuity the chest can be washed without removing the jacket.

The **treatment of spinal abscess** is not a satisfactory affair; many a child begins slowly to sink when the abscess is interfered with. Speaking generally, Billroth says:—"If the abscess comes from a bone on which an operation is impossible or undesirable, do not meddle with it, but be thankful for every day that it remains closed, and wait quietly until it opens." The advice is excellent; but when the presence of pus is causing constitutional irritation and distress by stretching sensory nerves, then the safe or *laissez faire* policy must be abandoned; and when pus is approaching the surface, and the skin is red, and about to undergo ulceration or sloughing, the abscess had better be opened by art than left to nature. Repeated tapping by the aspirator may be beneficial when the pus is thin, but my experience is that the scalpel has generally to supplant the aspirator. Tapping with the needle and trocar usually leads to disappointment, from pus leaking out by the wound and the abscess becoming septic.

A **post-pharyngeal abscess**, too, must be opened, but, bursting of its own accord, the pus be drawn with a convulsive inspiration into the larynx, and the child be suffocated. In dealing with such an abscess the patient should be anaesthetised; when he is propped in the sitting posture the head should be brought well forward and the mouth being fixed open by a gag, a free incision made into the bulging tumour with a guarded bistoury.

A post-pharyngeal abscess may be opened through the side of the neck; but if the tumour be prominent at the back of the pharynx, it had better be opened as briefly described above. If the skin at any part of the

* *Operative Pathology and Therapeutics*, page 674. Translated by Dr. Stanley.

neck be thinned from subjacent pressure, that spot may be selected for evacuation of the abscess.

To open an abscess.—When the time has come that a spinal abscess has to be evacuated, the opening should be made in such a position that drainage can be efficiently maintained. If, for instance, the iliac fossa be filled with pus coming from lumbar caries, the abscess may be opened in the region of the quadratus lumborum, the child being kept subsequently on his back. Psoas abscess, too, instead of being attacked in the base of Scarpa's triangle, should be opened by the side of the lumbar spine. Nature, however, is frequently allowed to indicate the situation at which pus shall be induced to find escape, but in her choice she is guided by anatomical rather than surgical principles.

I have long recognised the importance of opening a spinal abscess with reference to the question of perfect drainage, choosing for the site of attack of a collection of pus in the sheath of the psoas, a spot midway between the last rib and the iliac crest, at the outer border of the quadratus lumborum. CHASSAIGNÉ* and TREVIS have strongly advocated this treatment, the advantages of which may be thus summarised. The abscess is tapped, and the pus escapes at the most dependent point, and, as the patient lies on his back, the cavity drains itself without trouble or difficulty. The sinus having been thoroughly established, and the drainage tube admitted, accumulation is unlikely to take place. The opening is very near to the diseased bone, so that three or four inches of abscess cavity below this point at once begin to contract. The antiseptic dressings can be applied and retained in position more readily than if the drain were in the thigh, and they are less likely to be soiled by urine or feces. In addition to these advantages TREVIS cites another: that

* "Year Book of Treatment," 1884, page 182.

the diseased area can be explored with the finger, and carious or sequestered bone removed.

A short time since, when opening an abscess, which filled the flank of a boy with singular curvature, on introducing my finger by the outer side of the quadratus lumborum I detected in the cavity several sequestra which had been shed from the diseased vertebrae. The largest of them was, perhaps, of the size of a bean, others were of the size of a pea; they were quite loose in the space. The abscess was washed out with iodine water, and dressed with firm compresses of marine lint. The boy improved immensely after the evacuation of the abscess, and was eventually admitted into a house for cripples. His brother was under my care at the same time for large spinal abscess, which was dealt with in the same manner. In his abscess no sequestra were found.

As regards the exploration of the diseased vertebra through the lumbar opening, the method is probably of no great importance, though one has often done it. Sometimes on exploring one finds the cords of the lumbar plexus stretching through the pore, which has effected the complete disappearance of the substance of the process; sometimes one can detect carious bone, or the diseased surface of the vertebra covered with soft granulations; at other times all is anatomical darkness. At present, at any rate, the carious vertebrae are beyond the reach of active interference. The exploration is more a matter of interest than of clinical importance, though the opening of the abscess from the loin marks a real advance in the surgery of spinal caries. Care must be taken in no way to injure the neighbouring layer of peritoneum.

Lately, I have treated all cases of lumbar abscess by an anterior as well as a posterior opening, passing the drainage tube right through the cavity. In this way the most thorough irrigation is obtained.

Acute cervical abscess, with or without spinal aris, must be opened as soon as diagnosed, for the relief of the tension of sensory nerves, and to obviate the risk of serious extravasation. Such an abscess must be opened after Hilton's method, even before fluctuation is manifest or the skin reddened. An exploration can do no harm; the uncertainty must be set at rest and procure relief. The skin of the neck should be washed, and an incision of half an inch or more should be made along a border of the sterno-mastoid, any superficial vein being avoided. Then, with a steel director, a puncture is made in the deep fascia, and the fulcrum reached by scratching and gently tearing with the director; pus will at last flow along the groove. Then the end of a pair of ring dressing forceps is thrust along the groove and into the cavity, the blades separated, and so withdrawn. A free opening being thus made, and pus having escaped, the nozzle of an irrigator or syringe is introduced, and the cavity distended with hot water, to which tincture of iodine has been added, sufficient to give it a definite yellow tinge; and having thoroughly washed out all cheesy matter, sloughs of thrombosed, and debris, a full-sized drainage tube is inserted, and the opening packed around with salicylic wool and carbolic tow, the abscess walls are compressed with oakum pads and bandage. The following day a fresh dressing and irrigation will be required, and after this the cavity is irrigated and the wound dressed only when the temperature goes up or the discharge soaks through the dressings. Sometimes the dressing may remain unchanged, after the first or second dressing, for a week, or longer. The discharge becomes thin and watery, and the abscess runs its usual tardy course. A disadvantage of the iodised water was the blue stain which it left upon the sheets and night-dress, but this is obviated by following Percy

Boilston's suggestion of decolorising the fluid with a few drops of carbolic acid lotion.

Complications of spinal caries may come on with or without the formation of abscess. First among them may be mentioned paralysis, from pressure upon the cord, either of inflammatory thickenings or of the bodies of the vertebrae themselves. The front of the cord being especially affected by the pressure, motor paralysis generally results.

This paralysis may be of therapeutic value, as the child has to lie flat and quiet, during which time the bones obtain needful rest. The power of movement may return. A patient with high dorsal caries was paraplegic on one occasion for fifteen months, but the trouble passed away entirely. Another child was recovering from a second attack of paraplegia when the last record of his case was made. Sensation not being affected, the skin remains well nourished, and bed sores are of rare occurrence. Control over the bladder is preserved. Patients are lost from tubercular meningitis even when the spinal trouble seemed to be going on well. Others have died from pyæmia, bronchitis, or some intercurrent disease, such as measles or whooping cough, to which, from his enfeebled condition, the child proves a ready victim. The commonest cause of death is the exhaustion which is associated with the chronic discharge from the abscess; the liver may grow large and hard from amyloid disease, and the urine become loaded with albumen.

CHAPTER XX.

THE GENITO-URINARY TRACT.

In the process of development, a hollow growth, like the finger of a glove, starts from the hinder end of the facial intestine, and, extending upwards and forwards, leaves the abdomen by a wide gap in the anterior wall. This is the allantoin. Its pedicle is subsequently dilated into the bladder, whilst the upper part of the tube, continued through the umbilicus, is the urachus. Then a partition grows downwards to convert the existing cloaca into two passages, the urethra and the rectum. Thus at birth the foetal bladder is an abdominal rather than a pelvic viscus.

In rare instances the obliteration of the urachus may be delayed, so that urine, and even vesical calculi, have passed through the umbilicus of the young child.

Small vascular polypi may grow in the depths of the umbilical sheath. From macroscopic appearance, they probably take their origin from the surface of the urachus, which granulates after the attached end of the umbilical cord has fallen. At times no larger than a pin's head, they may attain the size of a currant or plum; they are bright red, bleed at the slightest touch, and are associated with the escape of



Fig. 18.—Developing bladder from hinder end of Allantoic Canal; Continuation of bladder through Umbilicus.

so much irritating secretion that the skin for some distance around the navel may be excoriated. They may be removed by a nip of the scissors, or their pedunculated base may be tied with a fine waxed ligature. Occasionally they are so deeply placed in the cicatrix that the walls of the depression must be held widely apart by dressing forceps before they can be dealt with. In every case of eczema at the umbilicus a careful search should be made in the circumfrenal folds of the navel.

Fæcal fistula at the umbilicus is another cause for eczema; it may be the result of prolapsed intestine having been included in the ligature of the umbilical cord, in which case evidence would be afforded within a few days of birth (page 202); or of the rupture of a strangulated umbilical hernia (page 263). A more frequent cause of the fæcal fistula is ulceration of the bowel, when inflammatory adhesions have attached it to the abdominal wall. The ulceration may be of tubercular origin, or may be started by a local peritonitis, but in each case adhesive peritonitis guards the general serous cavity against the entrance of the irritating fluids. A large abscess may precede the establishment of the fistula. The piece of intestine implicated is often the transverse colon; on the administration of a rectal injection, some of the fluid may be found escaping by the fistula.

The subjects of fæcal fistula are generally pale and ill-nourished; they must be kept at rest. The diet should be light; cod-liver oil and iron may be prescribed, and the oil may also be used as an injection. When the general condition is improving attention may be directed more definitely to the fistula, but no plastic operation or excision is likely to succeed. The bowels should be cleared by repeated doses of rhubarb and soda, and afterwards should be kept in absolute rest for ten days or a fortnight by a course of opium in

minuted down; the sore being left untouched under a thick dressing of vaseline and eucalyptus. I have recently cured two umbilical fistulae by these means.

At the outset of treatment, provided the general health of the child be tolerably satisfactory, all fistulous tracks should be laid open and traced to a single aperture in the aponeurosis of the external oblique. Undermined or unhealthy skin should be cut away, and electric granulation tissue scraped and freshened. Thus a large wound may be left, in the middle of which is the opening into the bowel; this hardly suggests any active surgical interference, though a gentle scraping of its borders may serve.

After the tissues have been cleansed and scraped, it may be expedient, in certain cases, to leave a fair-sized drainage tube, communicating with the interior of the bowel, chiefly with the object of stimulating the periphery of the deepest part of the aperture. Iodoform may be dusted over the surface, and twice a day the wound cleaned with an antiseptic and deodorising solution. It will be advisable to have the child carried out into the fresh air. This same treatment serves also in the case of fecal fistula in other regions.

Treatment of urinary fistula at umbilicus.—The urethral canal should be explored by the passage of a fine catheter; and, if necessary, the water should be drawn off at regular intervals, so as to give the abdominal opening the chance of closing. If contraction were delayed, the aperture might be touched with the bentoline caustery.

Suppuration at the umbilicus may be due to the presence of an umbilical polypus (page 257), or of some other source of local irritation. The depths of the cicatrix should be thoroughly explored under chloroform before treatment is adopted. When the discharge is associated with tubercular peritonitis, or

with a focal disease, the condition will prove obstinate. In certain cases it may be expedient to treat the condition on the lines laid down for dealing with focal disease.

Hæmorrhage from the umbilicus* may be observed within the first ten days of birth; it may await fatal examination. The blood may come up from the depths of the umbilical depression without there being any apparent opening in the skin; or it may well up in large quantities, soaking through compresses and bandages, and causing early death. It may even spurt out when the infant cries, and yet no opening be distinguishable. The later its appearance, the worse the prognosis. The pathology of the condition is not clear, but as some of the subjects have lost blood from the rectum, penis, or gums, it is probable that umbilical hæmorrhage may be an indication of hæmophilia. Though one hundred and fifty cases of death from it have been reported, there are records of but twenty-one autopsies, and the evidence which they have afforded is of a negative character. In many cases jaundice has occurred, and it has been suggested that the inability of the blood to coagulate may have been due to the presence in it of bile substances.

The **treatment** will demand the use of compresses and styptics, and the internal administration of iron, ergot, and opium. The actual cautery may be used at a dull heat; these failing, the skin about the umbilicus must be transfixed in two places by a fine sewing needle, and a second needle introduced beneath this at right angles, warmed being twisted around these.

No dissection should be made in a search for a bleeding vessel; this would probably make matters worse, the disease being constitutional rather than local.

* See also "Your Book of Treatment," 1885.

In the *British Medical Journal* of November 8th, 1884, Mr. T. F. Raven records a fatal case of umbilical hemorrhage. Soon after the hemorrhage began, Mr. Raven satisfied himself that the child was a true "bleeder" by making a slight scratch on the arm, and finding that the scratch bled for seven hours. This report confirms the belief that the condition is but an expression of the hemorrhagic diathesis.

Should a newborn child be extremely anæmic, or should the section of the umbilical cord have been effected with (surgically) aseptic scissors, *traumatic peritonitis* might probably be the result; fortunately this condition is rarely met with.

A case of **thrombosis of umbilical vein**, with diffuse peritonitis, is described by Lewis Smith.* The fatal peritonitis was associated with the casting of pus from the umbilicus. It might be due to pyæmia.

Infantile peritonitis may be idiopathic, or it may be secondary to an inflammation which has followed on the ligation or separation of the umbilical cord. Peritonitis may run its course even in fetal life, and may end fatally. In 185 cases of peritonitis in children, 102 occurred within the first fortnight, 63 in the third and fourth weeks, and 16 of the children were over a month old.† Later on in child life the disease is of rare occurrence, and may be secondary to internal strangulation, pyæmia, or injury. Two children have recently been under treatment for peritonitis from this last named cause. In one the inflammation followed a fall into a brick kiln, and was associated with rupture of kidney; in the other it was caused by a blow. The former patient recovered under the influence of a restricted diet, leeches, and opium; the other was the subject of local suppuration and of obstinate fecal stasis.

* *American Journal of Obstetrics*, May, 1884.

† *Quinquès's "Cyclopædia,"* vol. viii.

Intra-uterine peritonitis may set up so much thickening and adhesion of the bowel as to cause complete intestinal obstruction. In a case of this nature the formation of an artificial anus in the ileum gave marked temporary relief though it did not avert a fatal result.*

Unililical hernia.—Early in the process of development the abdominal cavity is wide open in front; gradually do its lateral walls come forward to join along the middle line. The part which is the last to be shut in is at the umbilicus, where the vessels to and from the placenta make their transit. It frequently happens that at, and for some weeks after birth, the unililical aperture persists, covered is only by skin, superficial fascia, and peritoneum. In such a condition a piece of intestine is apt to make its escape from the abdominal cavity; and it has happened that such truant bowel has been tied or cut with the unililical cord into which it was protruding. Possibly an officious nurse may commit the damage by cutting shorter the stump of the unililical cord, which the medical attendant has purposely left longer than usual; she should, therefore, be cautioned in such a case. Though most, if not all, of these herniæ would gradually disappear into the abdominal cavity if left quite alone, still judicious treatment will advance the natural process of obliteration of the aperture. A penny piece wrapped in linen and fixed by strapping perfectly flat over the ring answers well; no conical pad should be allowed, as this would retard the obliterative process. All straining efforts on the part of the patient should be checked (page 341). Strangulated or even irreducible unililical hernia in infancy is of the rarest occurrence, as is also an unililical hernia existing in later childhood.

It were superfluous to speak of active surgical

* *Brit. Med. Journal*, p. 1291; 1893.

interference is the case of the reducible umbilical hernia of infancy. The natural tendency is to cure; the surgeon has only to aid nature in the completion of the developmental process.

Adventitious umbilical hernia* is that protrusion which appears soon after birth and is not congenital; within the first year the umbilical opening is still the weakest part of the linea alba. Later on the cicatrix becomes firm and resisting, so that umbilical hernia in the adult very rarely passes through it.

A case of an umbilical hernia in an infant of three days old is recorded by Jordan Lloyd;† the tumour was so large that there did not appear to be room in the abdominal cavity for all of its contents; it looked ready to burst. Some of the bowel was returned into the abdomen, and a pad of dry lint was fixed by strapping over the remainder. This application was uninterfered with for five weeks, at the end of which time the tumour was of insignificant size. Lloyd rightly urges expectancy in all these cases. The abdominal cavity is increased in size after birth, and so the anatomical insufficiency is gradually effaced.

Strangulated umbilical hernia would be accompanied by constant sickness, possibly of a fecal nature, and extreme collapse; unless the strangulation were relieved the child would die exhausted, or unless relief came, indeed, by gangrene of the bowel and abscess. Adhesive peritonitis might prevent the extravasation of feces into the abdominal cavity, the case ending as fecal fistula.

Before the abscess broke there would be a dark, doughy tumour at the umbilicus, and possibly some

* Alfred Johnson's third lecture.

† Birmingham Hospital Reports, 1884.

† For reference see paper by March, St. Bartholomew's Hospital Reports, 1874.

emphysematous cracking from escape of gas into the connective tissue.

Operation for strangulated umbilical hernia would be needed if the judicious employment of ice and taxis failed to afford relief; but the cutting operation would not be needed immediately on the occurrence of symptoms. An incision should be made over the tumour; the sac would be opened, for the integuments are far too thin to admit of an extraperitoneal division of the strangulation. If the symptoms had persisted for some days, the sac should be opened without any attempt at an extraperitoneal operation. A small knuckle or some coils of intestine and omentum would be found in the sac, matted together from adhesive peritonitis.

If the bowel looked trustworthy the strangulation might be relieved by an upward incision and the protrusion returned. The sac should be dissected away and the aperture closed by deep suture.

But if the bowel appeared of a suspiciously dusky colour, an artificial anus should be established, and the case subsequently dealt with as a fecal fistula.

Fissura abdominalis.—When the abdominal walls fail to meet along the middle line, the visceral cavity being closed in only by thin membranes, all the coils of intestine may protrude, as in early fatal life, from xiphoid cartilage to pubes, being clearly visible through the transparent covering.*

In weakly, "potbellied" children a ridge-like bulging may extend along the exposed borders of the recti, especially when the child is trying to sit up from the recumbent position. It is due to a fraying out of the linea alba from the continuous distending force of inflated intestine; scirrhus may produce a similar effect.

Hiatus, or extroversion of the bladder,

* See Engel's "Text-Book," p. 24.

may be found in the male or female; the deformity is not incompatible with a long and useful life. Women affected with it have borne children; but as in man the condition co-exists with a urethra which is represented only by a groove upon the dorsal aspect of a rudimentary penis, fecundation would be scarcely possible. As Holmes remarks, there is no malposition of the bladder, as the term *extroversion* would imply, but the vagina is wide open on account of *absence* of its anterior wall, and the abdominal parietes having failed to meet. The umbilicus is very imperfectly developed; the pubic symphysis is absent, and the urine, as it trickles from the openings of the ureters, flows over the skin of the thighs and causes eczema or ulcération. Being coated by the mucous membrane of the bladder the protrusion is soft and bright red (Plate III., Fig. 2).

Treatment.—However well animals may be adjusted they are sure to choke; for children their use is impracticable. As regards operative procedures, the ureters have been laid into the rectum, with the idea of converting that piece of the bowel into an urinary reservoir. The objections to this practice are that the recto-vesical pouch of peritoneum is likely to be wounded and a fatal peritonitis to ensue; that should the patient survive the operation he will be troubled by constant diarrhoea, and that as the operation wound contracts the flow of urine into the bowel will be so seriously obstructed as to determine the occurrence of renal abscess.

Disappointment is apt to follow plastic operations; peritonitis, pyæmia, or exhaustion may bring on a fatal result, or the flaps of skin which have been raised and adjusted may slough or be torn asunder in an attack of retching. Whatever be the procedure, too much should not be attempted on any one occasion; if only the bladder can be covered in the girl will have been

great, as an apparatus can then be arranged for the keeping of clothing dry and the surface of the abdomen and thighs comfortable. The epispadias can be dealt with subsequently. As regards the age at which the operation should be undertaken no definite rule can be laid down; if the child be healthy at four years there may be no reason why it should not be done then. In some cases it may be advisable to turn the dissected flap with the skin surface towards the bladder, in others the raw surface. In the former instance, should the operation prove a success no serious inconvenience need be anticipated from the subsequent growth of hair against the border coating of the bladder. If the operation have been done in childhood the continual wetting of the epidermal surface by the urine will have rendered it more like a soft mucous membrane, and unfit for the production of hair. In dissecting up the scrotal flap care must be taken that the hernial sac, which in such cases is often present, be not interfered with.

Bridges of skin may be prepared for transposition by inserting beneath them for several days a film of oil-silk; eventually the end of the bridge is divided.

Mr. Holmes thus describes his method of operating: A square flap is to be marked out in one groin large enough to completely cover the cleft, and to be dissected up towards the cleft, and with its base at the edge of the cleft, and turned over like the leaf of a book, so that it may present its cutaneous surface to the cleft, which it will then completely conceal. Next, in order to fix this flap, a second is to be taken from the opposite side of the scrotum, running obliquely down from the edge of the cleft. This, having been dissected up as far as is necessary, is to be placed with its raw surface applied to the raw surface of the first flap, the flaps being carefully adjusted with fine sutures. Great ingenuity and

patience will be required in the arranging of the various flaps, and the child will require the constant supervision of a skilled nurse night and day.

Mr. Rudston Parker has lately obtained excellent results by the use of boracic acid as a dressing after an ingenious plastic operation. With boracic acid, decomposition is prevented and urinary infiltration rendered innocuous. During the course of the treatment the patient lay in a bath which was so constructed that the hips were continuously immersed in warm boracic lotion, the trunk and limbs remaining dry. If this method be adopted, the operation had better be postponed till the patient might be willing and able to lend his co-operation.

In all plastic operations for the closure of the hiatus it must be remembered that the integuments of the abdomen are thin, and that a little reckless dissection might involve the peritoneal cavity. Whenever possible, the tissues of the scrotum should be employed for bridging over the exposed membrane; it is often redundant, and is generally tolerant of surgical interference. The best result attainable in any case may be that the patient will be able the better to catch the dribbling urine in a properly arranged vulcanite reservoir. In consequence of the constant irritation at the opening of the ureters, and in consequence of impairment of proper working of the kidney, suppurative or cystic nephritis may cause the failure of the most carefully planned operation, and sooner or later entail the death of the unfortunate subject of the disease. These remarks apply also to other instances in which the normal outflow of the urine has been hindered.

Epispadias is associated with hiatus of the bladder, when, the poles being absent, the urethra is represented by a shallow groove along the dorsum of the penis. It may exist without malformation of the

bladder. The attempt to cover over the groove by means of skin flaps, which are brought up from the sides of the penis, or by homo-skin flaps from the scrotum, is not likely to give complete satisfaction.

Hypospadias is much more common; in it the urethra is open along the under aspect of the penis. It is due to arrest of development in the process by which the margins of the urethral groove, which begin at the uro-genital sinus, come over to join in the middle line. As the fusion of these lips takes place from perineum, through scrotum to glans, the floor of the urethra is more frequently found deficient towards the glans. In the commonest form of hypospadias, the floor of the urethra is deficient in the glandular part of the penis, the defect being associated with a redundant, hooded prepuce upon the dorsal aspect. To bring the glans penis through a transverse incision in this hood, and having turned the under part back to use it for the material of an urethral floor, are, briefly, the steps of the plastic operation which might avail. Experience seems to suggest that this slight malformation had best be left alone; but it may be necessary to stretch and keep dilated the small slit-like or pin-hole orifice of the urethral passage. Sometimes the urethra opens on to the surface of the perineum, in the front of the scrotum, or just behind the glans; in these cases the aperture may require dilatation, but a plastic operation, with the view of carrying on the urethra to the end of the glans, should not be undertaken. The plan of tying the glans with a red-hot wire, to establish a conduit in the proper position, has probably failed as often as it has been tried. Sometimes the meatus urinarius is closed at birth by a membrane which requires perforation. If, with an orifice in front of or behind the scrotum, the urethra be found to extend to the meatus, at which spot it is blocked by the membrane (obscure urethra), the normal meatus may be

opened up, and the abnormal aperture closed by a plastic operation.

If, as a congenital defect, the under surface of the penis be adherent to the front of the scrotum, the connecting integument and fibrous tissue may be removed by lateral incisions, and the edges of the scrotal wound be brought together by fine sutures. It is much better that all operations of this sort be done in childhood, before school life is begun, and before that time when operation is doubly fearful on account of the apprehension with which its performance is associated. To advise that an operation be "put off until he is older" may be to cloud the happiest part of a boy's life.

Phimosis.—The preputial fold of mucocutaneous tissue may be so redundant as to permanently conceal the glans penis, and by its tight embrace prevent the proper development of the glans; it may cause the glans to become extruded and misshapen. The preputial orifice may be so small as to obstruct micturition, or to completely prevent it. In the newborn infant the prepuce is naturally large, out of proportion to the size of the penis, and at that time definite adhesions exist between the glans and its covering. But although no surgical interference be adopted, the glans may be expected to advance and the prepuce retire until an appearance of a natural circumference has been produced. Dr. Champneys observes, that during fetal life the mucous layer of the prepuce is always blended with the glans, and that with approaching birth the adhesion melts away. Adhesions of the prepuce after birth is then the result of arrested development. To draw back the foreskin is extremely advisable, lest the lingering adhesions undergo further thickening. A slight permanent adhesion may cause much discomfort even in cradle life, and later on it may suffice to render the boy irritable and unmanageable.

If the prepuce cannot be completely retracted the smegma cannot be cleared from behind the glans, and, undergoing decomposition, sets up inflammation. One may often feel and see the hardened cakes of smegma through the translucent prepuce; the imperfect cleanliness may cause suppuration beneath the prepuce. Small calculi, which have been passed from the urethra, may be found beneath the prepuce.

The nurse should be instructed to get the prepuce back and gently to wash beneath it when the child has his bath. If this cannot be done without giving pain, surgical attention is necessary. Many an infant is allowed to suffer irritation in this respect from false modesty on the part of the mother or nurse; if in the cradle, or when on the nurse's knees, the infant pull at the prepuce an examination should be made. Sometimes there is adhesion near the corona, which has rendered the removal of some of the secretion impossible. It will then suffice to tear the prepuce back to beyond the corona, or to scratch through the adhesion with a director. If the prepuce, though long, be not tight around the glans, its orifice only being constricted, dilatation with the blades of the ring-drawing forceps may suffice; but rather than repeat this operation indefinitely, it is better at once to remove the end of the prepuce. I am a strong advocate for the operation of circumcision whenever there is any difficulty in uncovering the glans, or when, after having retracted the prepuce, there is difficulty in getting it forward. The treatment of phimosis without operation is, on the whole, an undesirable practice. It may be that a long prepuce may cause such constant peripheral irritation as to direct unwholesome attention to the part, and engender, if not suggest, a habit over which one would be glad to have passed in silence; a practice which obtains, as I have been informed, less amongst the circumcised than amongst other boys.

As regards the treatment of masturbation, Mr. Cooper Forster is probably right when he remarks that irritating applications, which produce soreness of the parts, are apt to lead to an aggravation of the disease. An unnatural shyness and a want of boyish energy may be the direct result of indulgence in the pernicious habit. Probably the best course to adopt is to take the boy aside and to talk to him kindly and quietly, explaining that unless he breaks himself from the practice a physical ruin may be awaiting him; but if he be not old or sensible enough to profit by such advice he must be carefully watched, and, if thought expedient, his hands might be tied behind him. Cassell has written* an excellent little essay on the subject, in which he alludes to the case of a boy, of four years, who was suffering from a godless indulgence in the habit. An inspection of the parts should be made to see that there is no source of accidental peripheral irritation, such as a long or partially adherent prepuce, retained smegma, or chronic eczema. Inquiry should also be made as to the presence of any rectal irritation.

If there be the slightest indication, the boy should be circumcised; or his bladder may be searched from time to time for a possible calculus. The sounding may be undertaken without an anæsthetic, provided it be done with care and delicacy, and the boy should understand that it may be repeated from time to time should occasion demand it. It is well that some punishment be held in reserve. In the case of girls, great cleanliness of the parts must be ensured.

The drugs which may be of service are iron, quinine, lettuce of potassia, and small and frequently repeated doses of sulphate of magnesia. The child should not be allowed to eat for some hours before going to bed, and he should be got up early in the

* Cassell's "Dictionary of Medicine."

morning. The bed clothing should be light and the mattress hard.

On this subject one should refer to the article by Humphrey in Holmes's "System of Surgery." He urges that it would be better if those who have charge of boys were less scrupulous in giving warning upon the matter. That much anxiety might be spared by timely advice seriously and kindly given, and that this would come better from the medical man.

Probably the baneful effect of the practice has been considerably exaggerated. In reviewing the question, Sir James Paget* remarks, that when practised frequently by the very young, that is, at any time before or at the beginning of puberty, masturbation is quite likely to produce exhaustion and nervousness, and that these mischiefs are nearly sure to happen if the excess be practised by those who are liable to epilepsy, or any other form of nervous disease. Mr. Lawson Tait writes: "I have always found the chief difficulty to be that of persuading those who have charge of schools that the practice was a physical delinquency rather than a moral evil; and that the best remedy was not to tell the poor children that they were staining their souls, but to tell them that they might seriously hurt their bodies, and to explain to them the nature and purpose of the functions they were abusing." Lucas attributes the association of fish feet and weak ankles, together with albuminuria coming on at about puberty, to the effects of the peripheral excitement.†

Balanitis is an inflammation of the glans penis and prepuce. Its common cause is phimosis. There may be profuse purulent discharge, which, escaping through the preputial orifice, makes the case look like one of gonorrhoea, with which, indeed, it may be associated. It may be the result of an injury. The

* "Clinical Lectures," p. 291. 2nd ed.

† *British Medical Journal*, May, 1884.

sooner that circumcision is done the better; one should not wait until discharge has been discontinued by the use of lotions.

Circumcision might, with advantage, be performed more frequently in early childhood. The removal of a long or tight prepuce may be the means of sparing the subject much unnecessary annoyance. The operation is a small matter in infancy, but its importance increases with youth and manhood, and especially when it is performed for paraphimosis, balanitis, or verrucae; more serious still is the condition when, from subpreputial irritation, intractable eczema, or epithelioma has supervened. Frequently one hears the grown patient, whose case calls for the operation, say with reproach, that the operation should have been done in his infancy. The operation may be undertaken even before the eighth day.

The following is the best way of operating, and for one great reason that it is bloodless. The patient, under the influence of an anæsthetic, and lying upon a pillow with a thick towel bobbed beneath the pelvis, should be placed in a good light. The bed is not a convenient place for operating; a dressing-table or the top of a low chest of drawers answers well. Having squeezed the blood out of the organ by gentle compression between the fingers, a small elastic ring, doubled if necessary, and tight enough to control the circulation, is slipped down to the root of the penis. Then, lest the glans be injured, the prepuce is to be drawn forward and held between the blades of the ring dressing forceps and the redundant skin, cut off by a large pair of scissors. The mucous membrane, which is closely covering, or perhaps adherent to, the glans, is not implicated in this cut, so that to complete the operation it will be necessary to tear it up along the dorsal aspect by the nails, or by two pair of dissecting forceps. All adhesions between the mucous

membrane and the glass must be torn through, and the membrane must be thoroughly reflected, but it is rarely necessary to remove any of it. It should be turned back and stitched to the skin-wound by four or six sutures of fine carbolized gut; if one of these sutures be passed deeply through the fissure the risk of bleeding will be still further diminished, for it is from this fold of membrane that bleeding is most likely to occur. A little strip of

dry lint may be lightly wound round the circumference of the end of the penis, and, last of all, the India-rubber band is to be divided by a snip of the scissors; this must not be forgotten. The only bleeding that can take place occurs when the band is cut, and, as a rule, it merely suffices to cause the dressing to adhere to the wound. If no bed-cradle be at hand, for keeping off pressure of the bed clothes, an ordinary willow-shaving hat box will be found



FIG. 28.—Arrangement for Elevating Circumcision, an Elastic Ring Encircles the Root of the Penis.

to answer the purpose when the bottom has been knocked out, the remainder being made to encircle the patient's pelvis. If the child be unable to pass water in the usual way, he will probably succeed in micturating if made to sit in a basin of warm water.

Those who are in the habit of perfecting circumcision as a rite do not suture the mucous membrane to the skin; but though the wound is washed over at the time with an astringent and antiseptic solution (wine), the operation is at times followed by serious bleeding. The insertion of sutures avoids all risks of hemorrhage, and ensures a rapid union of the

approximated surfaces; being of soluble material the sutures may be left to dissolve.

Before the operation of circumcision the surgeon should satisfy himself that the subject is in a good state of health, otherwise extensive inflammation and abscess may supervene, or the case may end fatally. Great care should be taken that all instruments used during the operation are absolutely clean, and that the surroundings of the patient after the operation are in a satisfactory hygienic condition. I have known two children in one family die of blood poisoning after circumcision performed by a careful surgeon; it was afterwards discovered that the soil pipe was leaking into the wall of the bedroom. When it is decided that the operation is necessary no half measure should be adopted.

The plan of passing a director beneath the dorsal part of the foreskin, and then slitting it up with a bistoury, is highly inadvisable. Though the effect obtained is secured in a quick and simple manner, the result as regards appearance is highly unsatisfactory; the large lateral flaps hang down and, infiltrated with serum, form an unsightly mass. Such condition will no doubt gradually improve, but in the meanwhile the parents may be found expressing their dissatisfaction at the result. One has heard of instances in which it was thought better that the boy should not be sent back to school until the peculiarity had become less conspicuous. To show that this style of operating (one cannot term it *circumcising*) is also a dangerous one, I will quote an instance in which the surgeon had the misfortune to introduce one blade of the scissors into the urethra, and so divided the dorsal part of the glans penis as well as the foreskin.

As the presence of a large prepuce may mask as well as give rise to the symptoms of vesical calculus, it is well to make it a custom to sound the patient

when, under the influence of the anæsthetic at the time of circumcision.

To take away but a small piece of the prepuce is almost sure to involve so much subsequent contraction that the condition obtained is anything but an improvement; one has thus seen a hard cicatricial ring where previously there was a soft skin. Parents are, in such a case, much disinclined to subject the unfortunate child to a second and necessary operation.

Paraphimosis occurs when the tight preputial orifice is drawn back behind the coronæ glandis, and embraces the penis closely and persistently. It is particularly apt to occur when the subject of a phimosis has drawn back the foreskin, perhaps on account of an irritation beneath it. It has happened from children playing with each other. As an attempt to replace the swollen glans is very painful, an anæsthetic should be administered, so that the surgeon can act more deliberately and certainly. The penis should be firmly embraced by the thumb and index finger of the left hand, whilst the struggled and indurated glans is squeezed empty of its blood and served by the continuous compression of the fingers and thumb of the other hand. The coronæ may be lubricated with vaseline, and in a little while it will slip back beneath the swollen preputial covering.

In the child this method can hardly fail if carried out steadily and patiently; as a rule it succeeds straightway, so that in cases which are of short duration, and the tissues are but little altered, it may hardly be necessary to give an anæsthetic. In more instances the tissues have become so hard and unyielding, from a long-continued paraphimosis, that this method may fail, so that it would be necessary to pass a sharp-pointed curved bistoury well under the dorsal aspect of the prepuce and divide freely; the restraining hand should not be allowed to free itself by

ablation. So soon after the reduction of a paraphimosis as the tissues have resumed their normal appearance, circumcision should be performed.

A brass ferrule, open at each end, was removed from off the edematous penis of a frightened boy; it was around the root of the organ, and the penile integument was so swollen that it bulged back over it. As it could not have been taken off by cutting pliers or a file without injury to the penis, the removal was effected by carefully winding a thread in close and even turns around the penis, beginning against the ferrule and proceeding towards the prepuce. As the winding squeezed the serum forwards needle-pricks were made in the skin to allow the escape of the serum; when the end was reached the thread was tied and the ferrule drawn off. On removing the thread the penis, which a quarter of an hour previously had been dropsical, was found small and shrivelled. Whenever a penis is found greatly swollen a search should be made about its root for a constriction caused by fine wire, elastic string, or horse-hair.

Hermaphroditism.—In the beginning of the third month of intra-uterine life, development has not yet indicated to which sex the fetus shall belong. There is a rudimentary elevation for the penis or clitoris, as the case may be, and just below it is the slit-like opening of the uro-genital sinus. Later on, a fold of integument is found on each side of the penis or clitoris; if the fetus declare for a female, these folds grow into the labia majora, and hide the clitoris; if a male, they are joined across the median raphe to form the halves of the scrotum. In the female, the lips of the uro-genital canal become the symphæ; in the male, they join along the under surface of the penis, to enclose the urethra. Just before birth, the testes descend into the lateral halves of the scrotum.

A partial arrest of development may occur at any

stage; if the development proceed from the indifferent to the highest type a male fetus will be the result, and if it stop short of this, a female.

A not uncommon type of hermaphroditism results when development leaves the penis without the extension of the incurved ridges below it to form the urethra, the integumental folds, though containing the testes, not being joined in the middle line to form the scrotum. Such a child, at the age of sixteen months, was brought by its mother to see if anything



FIG. 46.—Mitten's Case. Variety of Hypospadias.

could be done to improve the appearance. Those who had seen the child at birth had no doubt of its sex, and it was registered by the name of Florence Kade. The labia seemed normal; the clitoris apparently was hypertrophied, and hooded with a redundant prepuce, and beneath it opened the urethra; there was no vagina. But later on the testes could be detected in the lateral integumental folds; the subject was declared an imperfectly developed male, and the mother was advised to register him again with a boy's name. Nearly three years later the patient was again seen, and dressed as a boy; he looked a strong and sturdy little fellow; the accompanying illustration was made when he was between four and five years old.

It is necessary that the sex of such a child be determined at the earliest possible moment, otherwise great disappointment or trouble may be retained.

With simple hypertrophy of the clitoris to such an extent that it resembles the male organ, a careful examination of the parts, especially as regards the existence of the uterus, quickly sets the question at rest. A perusal of the literature of the subject of hermaphroditism* shows that cases may occur in which it is impossible to say, during life, to which sex the subject belongs, but such instances are rare. In such a case one may follow the advice given by Holmes, that the child be brought up as a male, rather than expose it to the disgusting and disappointing consequences of an attempted marriage.

If an error in the determination of sex be committed, it will probably be that an imperfectly developed male child is taken for a female. This is more likely to occur when the arrest of development has affected also the descent of the testes into the rudimentary scrotal pouches; search must be made for the testes, which may sometimes be brought down by pressing with the thumb along the inguinal canal.

Occlusion of the vagina is a congenital defect; it rarely results from adhesion of the labia from an antecedent inflammation. The septum extends from just below the urethral opening to the posterior commissure, and being thin and avascular, it appears grey and translucent when the labia are gently separated. If, as the infant lies on her back, the labia be firmly drawn apart by the fingers, the membrane tears through like so much wet paper, a few small drops of blood marking its connection with the labia. No instruments or anæsthetic is required for the operation. Though so slight a matter when performed in infancy, it becomes a serious business if

* Todd's "Cyclopædia."

the operation be postponed until puberty, or until the grown woman is found to be the subject of retained menses. In the infant, a second operation may be needed, on account of the lower part of the septum having been imperfectly torn through, or because the raw edges were allowed to remain in contact during the healing process. The thighs should be drawn up over the abdomen, so that the parts are well exposed; after the membrane has been torn, a small piece of cotton-wool, covered with vaseline, may be placed between the linear wounds for a few days. If the septum be allowed to remain undisturbed with, it undergoes thickening, and gives rise to that condition known as *imperforate hymen*.

Occlusion of the meatus urinarius, either with or without some amount of hypospadias, is a rare condition. If it exist in the otherwise well-developed male child, a depression may be found on the glans marking the site of the end of the urethra. In such a case a puncture should be made with a fine bistoury, and the aperture dilated with a director; the orifice must be prevented from closing.

Congenital narrowing of the meatus requires patient attention. It is apt to be associated with vesical irritation and nocturnal incontinence of urine. It may be enlarged by an incision, and then kept dilated by instrumentation. Sometimes the narrow meatus is completely hidden by a long and tight prepuce, so it is well to examine for it after a circumcision has been performed. If the meatus be small, the child will strain to pass urine, and in the expulsive effort a hernia may be started or augmented. Frequently, a congenital hernia comes to descent after dilatation of a small preputial or meatal outlet.

Retention of urine in a male child is probably due to a small vesical calculus being impacted in the urethra, or to an attack of inflammation having

occluded a narrow preputial orifice or a pin-hole *meatus urinarius*. If in a child with retention the preputial orifice be occluded, circumcision should be performed forthwith.

If neither preputial nor urethral opening be defective, a small calculus may be found, by pushing the glass or by sounding, lodged within the fossa navicularis, and blocking the outlet; on enlarging the meatus the calculus is easily turned out.

Or the calculus may be found impacted in the penile, perineal, or membranous part of the urethra, whence it must be extracted by a direct median incision, and without attempting to remove it by the use of urethral forceps. There may have been previous symptoms of vesical calculus. A soft catheter should not be passed to relieve the retention (unless as a temporary measure), as it might glide over the stone without giving information of its presence. Left in the urethra, the stone would probably cause ulceration and urinary abscess.

If a stone be impacted between the neck of the bladder and the root of the scrotum, no attempt should be made to push it backwards; but the surgeon should there and then cut down upon and extract it, steadying it during the operation by the fingers and thumb. Surely, this operation is a less formidable one than that of lithotomy. Moreover, to attempt to push back the stone may be to damage the urethra, and if dislodged, the stone might again become impacted, or cause misery extravasation. It is different in the adult, when a fragment is impacted after lithotomy, this is pushed back for further crushing; the child's urethra is not adapted for such treatment.

Retention of urine may also occur from rupture of the urethra by a blow; the presence of bruising upon the skin of the perineum or scrotum, together with the history, will show what is wrong. Blood

may escape from the meatus, or the signs of urinary extravasation may have already occurred. In the latter case, an efficient incision in the median line will be needed. On convalescence being established, the boy will require years of surgical supervision, lest intractable traumatic stricture of the urethra supervene.

Extravasation of urine may be the result of a stone impacted in the urethra, or of a blow upon the perineum. Whatever the cause, the treatment is the same; a free opening must be made into the urethra, or into the urinary abscess, down to the urethra, so as to ensure the complete escape of the urine. If there be no history of injury, the surgeon will search for impacted stone by the aid of a sound, but if there have been considerable suppuration or sloughing, he would probably fail to find it.

If urine have infiltrated the scrotum, penis, or the inguinal region, incisions will be required, and careful irrigations with a warm solution of boracic or carbolic acid, freely diluted. The patient may be made to sit in a warm bath; stimulants, with quinine and iron will be required. The case must be treated with promptness and thoroughness. The catheter should not be left in the bladder after the operation. The resulting contraction of the urethra will require a long-continued supervision and much patience.

Swelling around the urinary organs in boys is generally caused by extravasation of urine. But oedema of these parts may come on after measles fever.

Case.—A boy of eight, whilst "doing Blodden," fell astride the top rail of a hurdle; a large blood tumour formed in the perineum, and retention of urine supervened. The tumour was incised; a catheter (No. 6, English) was passed every other day. After a fortnight the temperature rose to 102°, and the hypogastric region became hard and tender. Pelvic

abscess was diagnosed; an exploration in the linea semilunaris discovered pus below and in front of the superior false ligament of the bladder. A counter-opening was made low in the other semilunar line, and a drainage tube passed through; the cavity having been irrigated with warm iodine water, iodoform was insufflated, and pressure applied. The temperature fell to, and continued at normal, and convalescence was established. All the wound healed, but twice a week a No. 7 bougie was passed, to keep in abeyance the traumatic stricture.

Principism in early childhood is generally the result of either vesical or prostatic irritation. A thorough retraction of the prepuce, and a clearing of the osseous sulcus of all irritating secretions, or a circumcision, will generally suffice to restore the parts to physiological rest. Chronic principism may be the earliest indication of calculus. It may be caused also by ascariæ.

Stone in the bladder of a child is more likely to exist in the male than in the female, as in the latter it may escape through the short and dilatable urethra. The presence of a calculus may give rise to chronic principism, and keep up constant irritation of the bladder, with urgent demands for micturition, so that the poor boy wets his trousers by day and his bed by night; for these uncontrollable acts he is often severely punished. So great may be the straining that, with the expulsive effort, the lower bowel is involuntarily emptied. From fear of soiling his trousers he runs to the closet when the urging comes on, and sitting there and straining, prolapse of the rectum may take place. From a lacerating of the congested lining of the bladder by the stone, blood may be mixed with the urine, so that the fluid is coffee-coloured. If the urine be allowed to stand, it may give a placental deposit of mucus or pus; and, even when freshly passed,

it may be found antiseptical and offensive. As the bladder is emptied the stone is forced against the tender trigone, and the child screams again; if the stone be driven against the urethral opening of the bladder, the stream is suddenly and painfully stopped. In these circumstances the boy discovers that he can best relieve himself as he lies upon his side, or by getting on to his hands and knees; in the latter position the stone falls from the trigone towards the summit of the bladder. Whatever the position assumed by the boy, he is apt to feel pain during micturition; there is much pain at the end of the penis; to allay this he pulls at the prepuce, which, from constant manipulation, may become elongated and inflamed. On rare occasions his fingers may be found white and swollen like a washerwoman's from constant soaking in the escaping urine.

The pain at the end of the penis with vesical calculus may be likened to that at the knee in hip joint disease, and may be ascribed to some confusion in transduction through the branch of the sacral plexus to the grey matter of the cord. Branches of that plexus supply bladder, penis, and prepuce. The converse of the proposition is found in the vesical irritation, which is the direct result of the irritation of phloeoia. Frequently irritability of the bladder, or, as the parents call it, "weakness of the bladder," is relieved by circumcision (page 293).

When two or more of the symptoms detailed above coexist, the prepuce should be carefully examined, or the child sounded. This simple exploration is urgently demanded, or the little patient may be tortured by needless suffering. The persistence of any one of these symptoms of stone should be the hint to sound, and although no stone be found, the passage of the instrument may effect a cure. If the result of the sounding be negative, and the symptoms continue,

the child should be sounded again and again, for the calculus, if very minute, may escape detection on the first or second session, though, as a rule, if a stone be there, it is discovered on the first entrance of the sound. Unless the stone be very small, it may be felt by digital examination *per anum*, but nothing practical is gained by this method of examination.

The injection of warm water into the bladder when one is about to search for a stone is not necessary, but lest the stone be hidden behind a mucous fold, and so escape detection, the surgeon should turn the child on the side, and have the pelvis raised, and then, if expedient, the exploration may be completed by passing the finger into the rectum. The theory of a calculus escaping detection (or, later on, of removal) from being lodged in a sacculus in the bladder wall is rarely acceptable; the bladder of a child is not sacculated. Sir William Ferguson quaintly remarked that "sacculated stones" were generally met with by the young lithotomist.

Calculus in the ureter may determine symptoms of stone in the bladder, yet sounding may give a negative result. Blank sounding should always be supplemented by help of the finger in the rectum. If the stone be small, and lodged at the orifice of the ureter, it may evade detection on many soundings; but at last it will escape into the bladder and be struck. The surgeon should not rest contented with one sounding, but while symptoms persist he should examine the bladder from time to time.

A stone lying in the orifice of the ureter might be struck by certain turns of the sound, and then, on lithotomy being performed, it might not be discoverable; later on it might escape and be found in the bed. This is not suggested as a likely explanation of a blank lithotomy, but as a possible interpretation of the subsequent discovery of a small stone.

If the meatus urinarius be small, or the child frightened, it will be better to "put him to sleep" before passing the sound, as by a sudden movement the urethra might be damaged. By engaging a child in earnest conversation on such a topic as that of the names of his brothers, or of his future walk in life, one may often manage to slip in the warm and well-lubricated sound before the patient's apprehension is aroused. A mixture of vaseline and oil of eucalyptus makes an excellent lubricant. The sound should have a beak rather larger than the shaft, and the beak should be short, so that it can be made to search every sinuous area.



Fig. 21.—The best form of *Sound*. The beak is cylindrical, end of meatus.

For the **operation of lithotomy** no special preparation of the patient is required further than the thorough clearing of the bowels by a full dose of castor oil, administered very early in the morning, or on the previous night. Whether the bladder be full or empty when the patient is brought upon the table matters little.

The only use of water in the bladder at the time of the operation is that its escape may afford information of the knife having entered the bladder; but the delicate sense of touch received through the knife gives this information with more trustworthiness.

The staff, which I strongly recommend to the operator who still feels himself free to make his choice of instruments, is shaped very much like the sound; the beak is quite short. Its median groove ends abruptly in a step just as the beak curves off; it is James Lane's modification of Key's staff. The advantages of this staff are that it is used as a sound when

the child is on the table, and that it forms a straight director from the perineal incision into the bladder. There is no chance of the knife slipping from its groove, and failing to open the bladder, or of its leaving the groove, and transfixing the posterior wall of the bladder; both these calamities have happened with the curved staff, with the inferior or lateral groove. The stop at the end of the groove of the straight staff guards the posterior vesical wall from injury, and the short beak prevents the staff leaving the bladder. The staff selected should be of a size comfortably to pass along and fill the urethra; the larger the staff, the easier is it to find the groove.

The child lying flat upon the table, and anaesthetised, the surgeon stands on the left side, introduces the straight staff, and feels and hears the click or ring of it against the stone. Of this both he and his chief assistants should be absolutely certain, for a "blank lithotomy" would be a distressing sight. If there be any doubt about the result of this final sounding, the child must be put back in bed, and the operation postponed. The stone may be there all the while, or it may have escaped through the urethra subsequent to the last sounding. There is to be no exception to this rule, that before proceeding to cut, the surgeon and his assistants are to make certain of the presence of the stone.

Then the child is to be brought to the end of the table, and the thighs flexed, and steadily and squarely held by two competent assistants; it is not necessary to tie up the child. A third assistant stands at the left side, holding the staff with the right hand, and, if necessary, raising the scrotum with the other. The surgeon sits in a chair at the breech of the patient, with a pot of vaseline, the knife, and the forceps ready at his right hand. He runs his fingers along the ridge of the pubic arch to the ischial tuberosity, in order to

takes his bearings, and then, having lubricated his left index finger, he feels by the rectum for the staff, and convinces himself that the bowel is empty, and, therefore, little likely to be cut in the operation. This proceeding should never be omitted, especially if the curved staff is being used, as after the stone has been found with the sound the staff might have left the urethra, by a false passage, and run between bladder and rectum. This would be found out only by rectal examination, for the surgeon who uses the curved staff does not feel bound to touch the stone with it, as he has just assured himself of the presence of the stone by the introduction of the sound. Probably some blank lithotomies are to be explained by the fact of the staff having strayed, and the bladder never having been opened. It matters little how the straight staff is held in the early part of the operation, for when the groove has been entered by the knife, the surgeon takes the staff into his own hand. The curved staff should be neither thrust towards the perineum (and rectum) nor hooked up under the pubes. Having arranged with the assistant as to the position of the staff (by the help of the finger in the rectum) the surgeon wipes the finger, asks the anæsthetist if he may begin, takes up the knife, gives a last look to the position of the thigh and the staff, and thrusts the point of the knife well into the middle line of the perineum, half way between the anus and the base of the scrotum, cutting freely outwards and backwards into the ischio-rectal fossa. If this first incision be free, the second part of the operation is made more easy, as the staff becomes more accessible. Only one knife is used throughout the operation; even for very young children its blade must not be too small, for the finger must be passed after it into the bladder.

Now the tip of the left index finger is thrust into the front of the wound, and the staff is felt in the

membranous part of the urethra; a scratching with the point of the knife lays bare the groove in the staff, in which the point of the knife is firmly lodged; a little lateral movement of the knife proves the point to be securely lodged in the groove. Then the surgeon takes the handle of the staff from the assistant, and giving it a very slight turn on its long axis, as as to direct the groove more towards the line of the wound, thrusts staff and knife in together as one instrument by the harmonious working of the two hands. On the escape of urine, or by appreciation of his having pushed the knife in far enough, he withdraws it, and passes the left index finger through the bladder wound, and feels the stone. For this he takes the staff into the right hand; but if he find the wound in the prostatic urethra too small to allow of the tip of the finger being passed on to the pelvic side of the staff, he enlarges it a little with the knife, otherwise he might tear through the rest of the urethral wall, and push the bladder right off the end of the staff. Probably such inefficient use of the knife at the base of the bladder is the commonest cause of blank lithotomy, for the surgeon having detached the unopened bladder, and having excavated a space by his finger in the depths of the pelvic outlet, mistakes it for the bladder. If the urethra have not been completely torn through, the timely opening of the neck of the bladder may yet prevent disaster; but if the bladder have been pushed off the staff, and the stone cannot be found and struck, the child should be sent to bed undisturbed. No speculative cuts should be made into the bladder with the forlorn hope of reaching the stone. Accidents may happen with any staff, but the curved one is more easily found in the perineum; whilst the other, when found, offers the straight, the easy, and the direct course to the stone.

An important rule is not to withdraw the staff until the finger is touching the stone. As the finger is working its way into the bladder it is stretching some tissues, and rupturing others, until a free passage has been effected. When the stone is touched, and the staff removed, a slender, straight pair of forceps is run over the finger on to the stone; the handles are separated, and by a little manœuvring the stone is caught, and gently drawn out by steady traction in the direction of the pelvic outlet. If the stone be large, it may be necessary gently to work the handles from side to side, and up and down, so as to stretch the wound to the utmost; no jerking is permissible. After the stone is extracted the finger should be introduced again into the bladder, to make sure that there is not a second stone. Some small vessel, such as a branch of the superficial perineal, may suggest the application of a ligature; or if a bleeding artery be deeply placed the test-pressure forceps may be of service; or the pressure exerted between the edges of the wound, when the legs are brought down and tied together, may suffice to check it, especially if a small piece of ice be left near the wound, or a syringe of ice-cold water be thrown into the bladder.

If these measures prove inefficient, a petticoated tube may promptly be arranged as follows: Through a small hole in the middle of a piece of linen, about four inches square, the open end of a vulcanite tube is thrust, the linen being firmly tied around the tube at about half an inch from the end. This end is introduced, and thrust into the bladder, and the space between the tube and the petticoat stuffed with strips of lint. With such compression bleeding should cease. When the tube is fixed in position, a syringe of ice-water may be injected into the bladder, to make sure that the water-way is clear. As a matter of routine this practice is not advisable. One has known a tube

which had been left long in the wound cause a sloughing into the rectum.

Formerly a great deal used to be spoken about the way in which the operator should hold the knife in the various steps of a lithotomy; he should hold it as unless him best; for my own part, I prefer to hold it as a pen.

There is a question as to what should be done if, when the child is on the table, prolapse of the rectal mucous membrane occur; following Halmes's suggestion, my practice has been to leave it prolapsed, as to reduce it is to make the lower end of the bowel full, and to render it more likely to be damaged by the knife.

After the operation the feet should be tied together, and the hammock laid upon a similar air pillow, over which a piece of mackintosh sheeting and (next to the skin) a draw-sheet have been carefully arranged. In this way the child will be kept from the irritation of the urine. For a day or two all the urine escapes from the wound, but as surfaces swell from transient inflammation, some comes along the urethra; as the swelling subsides the urine again escapes for a time by the wound. Then, as granulations fill up the aperture, the amount escaping by the wound diminishes, and at the end of ten days or a fortnight all is well. From the moment that the child recovers from the effects of the chloroform he is happy and quiet, whereas he was previously anxious and irritated. The less the wound is meddled with after the operation the better.

Suprapubic lithotomy might be needed if the stone were enormous, but such stones are probably things of the past. Trials of this operation have been made recently under the Listerian method, even for stones of moderate size, but it is impossible to improve upon the lateral lithotomy in childhood. If a young

surgeon did not consider himself competent to undertake the ordinary English operation, he could hardly be trusted to resort to the high operation, even with projection of spear and guano.

The **median operation** is not suited for children, as the rigid structures which fill up the narrow subpubic arch do not allow of the easy passage of any but small stones.

Lithotomy in boyhood is an operation which hitherto has met with no favourable reception from English surgeons; first, because lithotomy is already extremely satisfactory; then, because the boy's bladder is intolerant of interference, and the urethra not sufficiently capacious for the admission of a trustworthy instrument for working. But since the establishment by Bigelow of the principle of lithotomy with complete coccyxotomy at a single sitting in the case of the adult, the practice has been put in force in many successful cases in male children. Dr. Keen records* twenty-four cases in boys whose ages varied between twenty months and twelve years. In only one case was the result unsuccessful. The stone is to be crushed at the one sitting, and the bladder evacuated. The lithotrite used corresponded to No. 8 of the English scale. The evacuating tubes, fixed with a wash-bottle, were of about the same gauge. In some cases it was necessary to enlarge the urethra or urethra. The crushing was performed under the influence of chloroform, and expelition was sacrificed to delicacy in instrumentation.

The record of these results demands attention, and may somewhat qualify the adverse opinion which one may have previously entertained of the procedure. A healthy boy, with a healthy bladder and normal urine, with a urethra of average calibre and a stone of small size, would probably give a perfect result.

* *Indian Medical Gazette*, 1885.

to a careful lithotomy with immediate evacuation. Convalescence would be established almost immediately after the operation. But if the stone were large, or an examination of the urine and bladder gave evidence of its being composed of oxalate of lime, it would be suited for removal only by lateral lithotomy. Should the future of this operation be favourable, it must always be improper to compare its results with those of lithotomy, for in the latter operation must still be relegated all those serious cases with which the crushing operation is incompetent to deal.

Stone in girlhood.—The symptoms will be those of irritation of bladder and external genitalæ; there may be mucus or blood in the urine. Every girl with chronic vesical irritation should be castrated. In one case I extracted a stone of the size of a large raisin by the aid of a pair of ring dressing forceps; no incontinence followed. If the stone had been larger it might have been crushed with a lithotrite, and the fragments removed by an evacuating catheter, for lithotomy is an operation well suited for girls. The female urethra will bear a great amount of dilatation without suffering more than temporary loss of the function of the constricting fibres. Lithotomy through the vaginal wall can rarely be needed; the operation might entail the presence of a permanent vesico-vaginal fistula.

For sounding in girlhood the patient should be in the lithotomy position and the parts thoroughly exposed; even then there may be some little delay in introducing the sound into the bladder. Holmes remarks: "I hope it may not be impertinent to point out that at very early ages the vagina may be mistaken for the urethra." This caution is extremely pertinent; if there be any doubt, a second sound may be deliberately passed into the vagina to prove that

the fist has entered the bladder. On the finger may be passed into the rectum to show that the vagina is free; or the head of the urethra may be felt far above the perineum. If the child struggle so as to prevent a thorough exploration of the bladder being leisurely made, chloroform must be administered. A digital examination of the rectum should be made at the same time, as many of the symptoms of stone may be due to chronic constipation.

Incontinence of urine, or *enuresis vesicæ*, etc., make water in bed if any prove an extremely troublesome pathological condition. In many cases the mother or nurse regards the habit as simple carelessness, and the poor child is subjected to punishment of increasing severity. This domestic policy generally fails. At any rate, in most of the cases which are brought to me, it has been ineffectually pursued; but as the enuresis grows worse, in spite of the withholding of childish pleasures, and in spite of whippings, the fact begins to be recognised that the matter may have passed beyond the patient's control.

I range myself upon the side of these unfortunate children, believing that they may be no more able to hold their water than they could avoid coughing if a crumb fell into the larynx. A teacher may find it a difficult matter to know when to refuse a child's request that he may "leave the room;" no doubt he is occasionally imposed upon. Under the high pressure of modern education children are apt to be subject, through the influence of the sympathetic system, to a simple form of diuresis. Unless the nervous and excitable child feels that he can at all times obtain a kindly permission to retire, he must be kept beyond the risk of harm. Under the influence of fear in a school examination, I have known a healthy boy to void his urine when standing up in class. Another nervous subject, who was considered to have

a "weak bladder," suffered serious distress from his master refusing him the opportunity of relieving himself.

Though enuresis may sometimes be regarded as a passing inconvenience rather than a serious trouble, still the sooner it is overcome the better. Dr. Champneys has remarked* upon the prejudicial effect which it may exert upon the ureters and kidneys. The act of micturition is necessarily associated with the damming up the urine in the ureters, and when the strain is of very frequent occurrence, the obstruction may be followed by dilatation and hydronephrosis. He instances the case of a boy of eight years, who was the subject of diurnal and nocturnal enuresis. Circumcision gave slight temporary relief, but death followed an attack of coma after diarrhoea. The urine was of a low specific gravity, and contained a trace of albumen. There was no inflammation of the contracted bladder, but the ureters and the renal pelvis were greatly dilated. Two other boys died similarly after enuresis produced by an abnormal state of the prepuce.

That a long prepuce is apt to be the cause of "irritation" of the bladder is a matter of such frequent occurrence as often to escape recognition; it is the converse of the proposition of above in *balanitis* and itching at the end of the penis. By day the boy endeavours to allay the symptoms by pinching the prepuce; but by night, when the brain is dormant, and the supervision of the genito-urinary tract is left to the care of the grey matter of the cord, a certain mismanagement is apt to occur.

The sensory filaments, which are distributed to the mucocutaneous tissue at the end of the penis, are derived from the internal pudic, itself a branch of the sacral plexus. The nerves of this plexus have

* See Bartholomew's Hospital Reports, vol. vii.

themselves in the grey matter of a certain part of the spinal cord, from which are passing out, through that same intercrossing, the efferent fibres for the supply of the muscular walls of the bladder. This same colony of cells receive the filaments which carry up sensations from the mucous membrane which lines that viscus. It may be on account of the exceeding sensibility of the protoplasmic substance of these cells; or it may be that by design and education

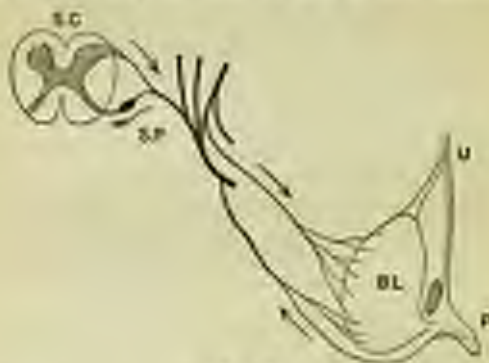


Fig. 42

sc, spinal cord; sp, sacral plexus; bl, bladder; p, penis; u, urethra.

they are specially occupied with the care of the bladder rather than of the end of the penis, that they are apt to interpret the different messages coming from the less important area as signals of distress from the bladder itself. For these signals they have but one means of relief, and, this being put in force, the boy runs the risk of severe punishment in the morning for having unnecessarily wetted his bed.

If there be any tightness, redundancy, or adhesion of the prepuce in a boy who suffers from incontinence

of urine, this must first of all be put right. A simple dilatation of the preputial orifice will not suffice. Contraction of the tissue will be likely to follow, and years afterwards, when the desirability of the prepuce being short and bendy is more than ever urgent, the unlucky boy is found in need of definite surgical interference. (See page 273.)

If there be nothing in the condition of the prepuce likely to account for the vesical irritation, a careful examination should be made of the meatus of the urethra; if this be no larger than a pin-hole, it must be incised and kept permanently dilated by the insertion of the beak of a sound.

If both prepuce and urethral orifice be found, after careful inspection, perfectly normal, inquiry should next be directed to the condition of the bowels; the child may be the subject of habitual constipation, in which case he will improve on a course of rhubarb and soda. Or, if constipated and anæmic, he may make greater progress under the influence of a course of laxative iron mixture. The close association existing between the bladder and rectum through the network of spinal and sympathetic nerve fibres, renders the dependence of vesical irritation upon a loaded rectum at once evident; the presence of a rectal polypus, also, may give rise to incontinence of urine (page 212).

For thread-worms the administration of the laxative may be supplemented by the use of rectal enemas of weak solutions of common salt. If the child be feeble a course of cod-liver oil and iron may impart the needed strength, the diet being wholesome. Fresh air and regular hours for meals and sleep may do much.

An excess of nitrogenised food may possibly render the urine irritating; and the child should not be allowed stimulants of any kind; he should

food only of regular nourishment, and cakes and sweet-stuff should be prohibited. The child should not be allowed to eat or drink just before going to bed. I have not found, however, that restricting the amount of meat eaten in the course of the day is an important element in the treatment of the case. Nor have I found the use of belladonna or opium of that value which one is led to anticipate.

In the practice of other observers, however, belladonna has acquired a considerable reputation. It should be given in steadily increasing doses and at intervals of from two to three hours, until, by the dilatation of the pupils or other signs, it becomes evident that the toxic effect is obtained. Then for some hours the administration should be omitted, and subsequently continued in smaller amount. One may begin with four minims of the tincture, and, carefully watching the effect, steadily increase it. To give it in a fixed and limited dose, as one administers tincture of iron, for instance, is not calculated to obtain the therapeutic value of the drug. Children are peculiarly tolerant of belladonna.

A good deal may often be done by breaking the excito-motory chain of the sleeping child of its bad habit by taking him out of bed once or twice in the night for the purpose of micturition; this may be done at the time of the parent or nurse going to bed or getting up, or the child may be roused at an earlier hour in the morning. The child should not be allowed to lie upon the back, as in that position the urine may prove to exert a greater irritability. A cotton-reef harnesses over the lumbar vertebrae will ensure his sleeping on the side.

But if all these matters have been in vain attended to, or if a combination of circumstances lead one to suspect that the irritation is due to vesical calculus,

the patient must be sounded once, twice, or as many times as necessary (page 264).

All the irritability may cease on the sound being introduced, even though no stone have been detected. Sounding should be adopted as routine practice in the treatment of *enuresis*, even although no symptom of vesical calculus, beyond that of irritability, exist. To admit that this treatment is empirical is not to detract from its practical value: one does not yet understand how it is that the application of a small blister to the groin suffices at times to put an end to the night screams of the child with hip joint disease.

If the *enuresis* be simply the result of a bad habit, the way in which the sounding (which is to be repeated if necessary) will act is very evident; in every instance the surgeon may suspect at the beginning that the trouble is due to the presence of a stone. Mr. Cooper Foster remarks suggestively that now and then a calculus has been struck when least expected.

Food must be given to the reaction which the urine has when freshly passed; if it be extremely acid the child may be advantageously treated with a course of soda and gentian. Possibly such a child is born with potential gout or rheumatism: one frequently finds that an infant with extreme *paralysed* has a parent at that very moment, or at no distant period, laid up with an attack of gout or rheumatism. A child with such an hereditary may have a diathesis which yields to the very same drugs which best suit the parents.

If the urine be alkaline when freshly voided, as happened lately in a most obstinate case of *incontinence*, the child's health must be improved by issues of the mineral acids, and if advisable by a change of air and diet, or the reaction may be changed by a course of benzoic acid in doses of two, three, or five

grains given in lead pills. Too much confidence must not be placed in the use of drugs alone; attention must be paid to all the accessory means of treatment; but the improvement obtained is very apt to be ascribed entirely to the medicine given.

A drug of which patient trial may be made in intractable cases is morphia, in doses beginning at the twenty-fourth part of a grain; whether it acts through the nervous system as a stimulant or sedative, or whether it acts directly through the urinary secretion, is uncertain. In peculiar, irritable condition of the mucous membrane of the bronchial and intestinal tract its beneficial influence is very marked; it may be that in enormous morphia acts much in the same way as does belladonna.

Trial might also be made of liquor strychnie, beginning with doses of half a minim, and steadily increasing the amount. It should be administered at short and regular intervals; the plan of giving a child a comparatively large dose of a drug three times a day is less efficacious than that of giving a minute dose every hour or two.

It has been suggested that strychnin may act by improving the condition of the sphincter fibres at the neck of the bladder; it seems more probable that its influence may be rather upon the tone of the tissues generally. It may be in this form of enuresis (where the sphincter vesicæ has become indolent or has lost its tone) that electricity will be of service. To what extent, however, the continuous or interrupted current about the loins and perineum may be of therapeutic value in the treatment of these cases I am unable to offer an exact opinion; but when all other remedies have proved futile the effect of electricity through the sacral, hypogastric, and perineal regions may be tried; when one is in the dark as to the pathology of enuresis, the empirical use of the battery may be the

means of supplying the needful "tone" to the nervous system of the apprehensive little patient.

Of the treatment of enuresis by elastic bands or pads applied to the urethra I have no practical experience, nor do I desire it. Cases are on record where unhappy children, in their anxiety to prevent their wetting the bed, have tied a ligature so tightly round the root of the penis as almost to cause gangrene.

If every effort to cure the child have proved disappointing, it is still a consolation to the parents to learn that the trouble will for certain wear itself away. Little boys suffer from it much more than older ones, and as puberty approaches the disease is sure to fade away. In the meanwhile it is not advisable that the child wear an indomitable urinal at night in order to spare the wetting of the bed. Such an apparatus would be calculated to render nurse and parents less earnest in their endeavours to hurry on the cure, while the effect upon the child would be extremely prejudicial.

Incontinence of urine in girlhood.—Much of what has been remarked above applies equally to incontinence both in boys and girls; but in the case of the female child the trouble may be due to the presence of a vascular polypus at or within the meatus urinarius, which, by irritating the peripheral nerves, disturbs the vesical system much as does the retained uregina in the other sex. Such a polypus may be no larger than a pin's head, or it may be the size of a walnut; it is a bright papillary outgrowth of the urethral lining. For its detection the patient must be anaesthetised, and placed in the lithotomy position in a good light. The urethral walls may be held apart by the blades of dressing forceps, the polypus being removed by a snip with the scissors.

If a girl be the subject of incontinence, for the cause

of which repeated examinations offer no suggestion, and empiric treatment provides relief, it may be advisable to dilate the urethra and explore the interior of the bladder with the finger; experience shows that the paralysis caused thereby is transient and beneficial.

A most inveterate case of incontinence, in a girl of about nine years of age, completely recovered when, as a last resource, the urethra was dilated. The left index finger introduced into the bladder found nothing abnormal. Previous to introducing the finger the urethra was dilated by the drawing forceps. Dilatation by the use of laminaria tents is undesirable; in a case under the care of Giraldès such treatment was followed by benzenism, vulvitis, and enlargement of the vaginal glands. Nor should the treatment by dilatation be adopted until every other means has had fair trial.

Hæmaturia generally results from vesical calculus, and in every case of blood-stained urine the child should be searched. Other causes are injury to the kidney, bladder, or urethra; foreign body; malignant or papillomatous disease; acute nephritis, scarificæ, and renal calculus.

Rugous bladder.—Occasionally, on sounding, the lining of the bladder is found rough from prominent folds which impart to the sound a peculiar leathery feel. What the exact pathological condition may be I cannot say. Certainly the sensation is not due to the presence of tubercular or villous disease, for the child not only survives, but also, under some tonic treatment, loses the symptoms of stone which originally called forth the exploration of the bladder.

Of polypoid tumours of the bladder.—Giraldès gives in his "*Clinical Lectures*" (p. 535) two examples; one protruded in a fungating mass through the meatus urinarius of a female infant. Mr. Birbeck and others have recorded very similar cases.

The history might begin as one of vesical irritation, then stone would be suspected; the sound, or in the female the finger, may detect a strange substance, and the exploration would be followed by further bleeding. No radical treatment short of suprapubic cystotomy would be likely to avail.

Case.—A boy of six was admitted for retention of urine, a condition to which he had lately become liable. Just before sending him into hospital, his medical attendant had had difficulty in introducing a catheter; when in the hospital the house surgeon also met with obstruction. On my seeing the boy, soon after admission, there was much difficulty in passing the instrument, and there was evident fulness in the perineum, probably from extravasation of urine; perineal section was performed. After a day or two this incision failed to afford sufficient escape for the urine, so the wound was continued on into the bladder. (See page 282.) A severe outbreak of scarlet fever then occurred in the ward, and the child took infection and sank. Post-mortem examination made by Dr. Chaffey showed that the obstruction was caused by a sarcomatous growth starting from the trigone and blocking the neck of the bladder.

Vulvitis is common in weakly or strumous children. It may be due to the presence of thread worms which have immigrated to the vulva from the rectum. Sometimes the inflammation is the result of dirt, or of incontinence of urine. It may be associated with eczema of the perineum and thighs, or with strumous ulceration of the mucous membrane. Possibly the inflammatory attack may be caused by the lodgment of a foreign body.

The tissues are swollen, red, and painful. Attention may first be directed to the condition by the linen being soiled; by the child constantly rubbing or scratching the parts, or by the frequent irritation.

The **treatment** of acute vulvitis will require the adoption of soothing measures, and absolute rest in bed. The first examination of the parts should be thorough, and it may call for chloroform.

Frequently in the course of the day the child may be made to sit in warm water, to which an antiseptic solution has been added. A mild lotion may also be used with a syringe, the labia being subsequently kept apart by strips of wet boracic lint. After each washing the labia should be carefully dried by a soft towel; they may then be dusted over with starch-powder, or anointed with vaseline and eucalyptus. If the urine be strongly acid, acetate or bicarbonate of soda may be given. The food should be of a fluid and nonstimulating nature.

When the acuteness of the attack has passed off, iron and other tonics will be required.

Gonorrhœa.—Vulvitis of venereal origin is occasionally met with, but the disease possesses no characteristic feature whereby it may be certainly recognised. The profuseness of the discharge offers no differential feature. If the parts were bruised or torn, the suspicion of the child having been wronged would be grave; but when perversity and hysteria influence a clever girl, a simple leucorrhœa may be made the subject of an accusation which is as groundless as it is serious. Parents are naturally anxious and suspicious when a child is suddenly found to be the subject of purulent vaginitis; the discreet practitioner will do all in his power to allay groundless fears, and prevent the child being made an object of curiosity or of harmful attention.

In certain districts of England, where superstition lingers and charms and spells are still believed in, the adult male is apt to be under the apprehension that the specific urethritis from which he suffers can be straightway cured by contact with a child; in this

way, as in others, periorbital inflammation may be contaminated.

The **treatment** will be that described above; it is expedient to begin with the administration of a dose of rhubarb and soda, or of castor oil. The child should be made to sit in a mild, warm, antiseptic solution. This should be done at least twice a day, night and morning. Being surrounded with a blanket, the child may remain in the bath for fifteen or twenty minutes. A weak lotion of boracic acid, coccois sublimata, or other astringent and antiseptic may be used with a common glass syringe, and a small piece of iodoform wool gently tucked between the labia. Absolute rest in bed is a most important element in the treatment.

Aphthous vulvitis is spoken of by Sarazin* as of common occurrence in hospital practice, especially in connection with an attack of measles. The parts are to be frequently washed and carefully dried, finely powdered iodoform is to be dusted over the membrane, and the labia are to be kept apart by a small tuft of iodoform wool. Constitutional remedies will be employed and the child kept in complete rest.

Noma.—Noma is a limited gangrene of the generative apparatus. It bears a close relationship as regards pathology to both hospital gangrene and necrum oris. (See page 185.) It is more frequently met with in girls than boys; I have on one occasion only seen it attack the scrotum.

Noma vulvæ is apt to attack the child who has been reared in an atmosphere of poverty and dirt, especially if her constitution have been taxed by a recent illness of such a kind as measles or scarlet fever. The subject of limited gangrene from acute inflammation is entered into in a previous chapter, and reference may be made to it on the question of treatment.

* "Revue mensuelle des Maladies de l'Enfance," 1884.

Prognosis in anus valve is fairly satisfactory. The result as regards ultimate deformity from cicatrization compares favourably with that left after cancerous oris, the lax and abundant tissue in the pudendal region is readily drawn up to obliterate the gap left after the separation of the slough. Should ulceration implicate either commissure of the valve or the adjacent margins of the aperture, careful dressing would be demanded; or should a partial stricture supervene, a plastic operation might be required.

The fever and exhaustion associated with anus are often extreme, and it is no wonder that the miserable child who is the subject of the disease sinks under it. During the separation of the slough blood poisoning is apt to appear.

Noma scroti is a rare condition; its appearance, course, and treatment may be inferred from the foregoing paragraphs. Reference may also be made to the subject of cancerous oris, page 181.

CHAPTER XXI.

THE KLITUM.

Imperforate rectum.—During development, the upper part of the rectum, which is developed from the internal blastodermic layer, descends into the pelvis, but is separated by a considerable depth of tissue from the surface of the perineum. There a depression is found in the skin, at the site of the future anus, which, deepening into the pelvis, forms a slit into the upper end of which is fused into the blind end of the bowel to complete the outlet. If absorption of the partition fail to take place, complete

intestinal obstruction will result, though the anus itself may be well formed: An infant three or four days old had passed nothing; the nurse had dosed it with castor oil; it was desperately sick. On introducing a finger a septum was detected; this was broken through with a director, and the opening dilated with dressing forceps. At once a motion was passed, and the child did well. Such



Fig. 43.—a, Pelvic portion of Rectum, descending towards outlet.

cases may give perpetual trouble from contraction of the remaining anal constriction (Fig. 44).

A girl, of five years, was under treatment for a constriction an inch and a half within the anus, which was so unyielding that all that could be done was to wash out the fecal accumulations from time to time by an irrigator. Excision of the hardened tissues is a speculative and unsatisfactory procedure. If the

obstruction cause constant distress, the question of colotomy may be considered.

Imperforate anus. —

Occasionally, when the rectum is perfectly formed, a thin membrane skins over the anal orifice; the diagnosis and treatment are evident. If the



Fig. 44. — a, Imperforate Rectum, A, skin.

anus be small it will require dilatation with the finger, the nurse being taught how to treat the child. In every case of obstinate constipation digital exploration *per anus* should be undertaken (Fig. 45).

There may be no trace of anus, though the pelvic part of the rectum is properly developed. It is then necessary to introduce a sound, as a guide, into the bladder or vagina, according to the sex, and, with the child in the lithotomy position, to dissect up along the

sacral curve, in search of the bulging sub-derm, exploring carefully with a firm director. If the search prove successful, dilatation must be effected by the dressing forceps and dryer, and the nurse subsequently instructed how to maintain the dilatation. To diminish cinctorial contraction, the end of the bowel should, if possible, be brought down to the surface, and there secured by sutures (Fig. 43).

Littre's operation.—If the search prove ineffectual, the child should be placed upon its back, and an incision made in the left iliac region somewhat as



Fig. 45.—Imperforate Anus.

A, Rectum; R, Anus.

if an iliac artery were about to be tied; but the peritoneum is to be opened. The first piece of intestine to escape is usually the sigmoid flexure, but it is attached by so wide and free a mesentery that it might be taken for a piece of small intestine; absolute size of bowel is no guide as to its kind.

The colon being greatly distended, no trace exists of the longitudinal muscular bands, but on following the bowel towards the pelvis its identity becomes established. An assistant should then gently compress it with the finger and thumb above and below the spot at which it is to be incised, lest, whilst the edges of the opening are being stitched to the skin wound, necrotism find its way into the peritoneal cavity. The best dressing is a liberal one of absorbent wool.

I have had occasion to perform this operation on six infants with imperforate rectum.* The first did well for three months, at the end of which time another attempt was made to establish a perineal anus, a flexible bougie being passed down the sigmoid piece of the bowel; this operation was accomplished, but

* *Brit. Med. Journal*, 1880.

post-mortem examination showed the serous covering of the rectum to have been damaged. The second was a male child, whose acute symptoms were relieved by the operation, but who died three days later. The third had peritonitis at the time of operation, and died on the fourth day after it; the lower part of the rectum was represented by a firm fibrous cord. The fourth case was similar. The fifth perfectly recovered from the colotomy; but after three months, on an attempt being made to establish the perineal anus, fatal peritonitis supervened; the pelvic piece of the rectum was found encased with peritonium. The sixth case resembled the third.

In five of the six cases the sickness stopped as soon as the intestinal contents could escape, the children obtaining immediate relief; and two of the children might possibly have been alive now had not rotated content with the permanent artificial anus.

That the loin operation, *Amussat's*, may be successfully performed in children is beyond question, but it can rarely be done without implicating the peritoneal sac on account of the colon being almost entirely surrounded in a loose and long mesentery. Though the peritonium be wounded in two places in the loin the child may recover, just as it may after the groin operation (*Littre's*), but the latter operation is so rapid and easy of performance that it should always be chosen. Other objections to *Amussat's* operation in these cases are that the descending colon is apt to have wandered from its normal position, even to reach the right side of the abdomen, and that the large intestine may be absent or imperfectly developed. If the groin operation be undertaken,



Fig. 30. — *Natural Col-de-sac surrounded with Peritonium, and ending in Fibrous Cord.*

this can be leisurely made out, and, if necessary, the small intestine opened instead.

That a groin abscess is not, after all, a dreadful condition is shown in Curling's* essay; speaking of a lady so afflicted, he says: "She constantly enjoys the best health, goes into society, attends balls, and no one would suspect her to be the subject of any infirmity. She is married, has borne four children, and her pregnancies and labours have been quite normal." In the case of imperforate rectum the sooner the groin operation is performed the better; there should be no waiting for symptoms, which, in tender children, are the beginning of the end; and no sharp instruments should be blindly thrust up into the interior of the pelvis through the carefully-performed dissection in the perineum.

A reference to Fig. 38 shows how the rectum may open into the bladder, urethra, or vagina. Sometimes it opens upon the front of the peritoneum through a narrow fistulous tract. If there were not solid material in the faeces these abnormalities would be of comparatively slight importance; perhaps the least serious irregularity is that in which the faeces are discharged through the vagina. In any case an attempt may be made to establish the normal anus, but if that fail Little's operation may be resorted to. Further particulars regarding these abnormalities may be found in Mr. Holmes's "*Surgery of Childhood*," whence also the following is extracted: "It is argued in some surgical works that the surgeon should abandon to death the subject of imperforate rectum. I doubt the morality of this reasoning; I do not think we have the right to abandon a patient to certain death if we know of any means likely to save him."

Prolapsus ani.—From constant straining the mucous membrane becomes congested and hypertrophied, and the fibres of the submucous layer so stretched

* *Trans. of Med-Chirug. Society*, vol. xlv.

that the lining membrane bulges in a dusky annular fold outside the anus; but in certain extreme cases the muscular coat of the bowel also descends. It may not be in itself a *disease*, but, like hernia (page 341), should be regarded as a symptom. Among the children of the poor it is often the local expression of constitutional weakness. Sometimes it is the result of the weakness and of the forced expulsive effort of whooping cough or chronic diarrhoea; or it is due to the straining associated with habitual constipation, worms, rectal polypus, piles, or stone. Cooper Foster advises the enema of every child with obstinate prolapse, a measure which I invariably adopt.

In the January issue of the *Revue de Chirurgie*, Bockel reports three cases of troublesome prolapse, in which he diagnosed at the moment of the protrusion a narrowing of the bowel, dilatation being followed by speedy cure. The editor of the *Lancet** is unprepared to accept Bockel's view of these cases, and I must confess that the context leads me to share these doubts.

The **treatment** will vary with the cause; but it is advisable at the outset to pass the finger gently within the relaxed anus. If the rectum be found loaded with hardened feces, rhubarb and soda mixture three times a day may commence the treatment. The child should not be allowed to sit upon closet seat or chamber urinal, but should be made to lie upon his side and pass the motion into a cloth. If, notwithstanding this precaution, prolapse recur, the mother or nurse should be instructed to pull the skin from the neighbourhood of the anus, upwards over the ischial tuberosity, each time a motion is to be passed, so as to put the mucous membrane of the lower bowel on the stretch. Simple enemas may be of service.

The habit of allowing a child to sit for an indefinite

* *Lancet*, January 24th, 1885.

time trying to pass a motion is reprehensible in the extreme.

If diarrhea cause prolapse, the bowels should be thoroughly evacuated, and then kept quieted by castor oil and opium; rhubarb and soda mixtures, and afterwards a course of soda and gentian, or cod-liver oil and iron with an occasional laxative, may be resorted to. It is sometimes advisable to procure the evacuation at bedtime, so that the chance of descent may be lessened. Prolapsed bowel should be well washed with warm or cold water, carefully dried with a soft cloth, dusted with finely powdered alum, and returned by firm but gentle pressure as the child lies upon the face. This position should be kept up as much as possible, a large pillow being placed under the pelvis and thighs. If the case be obstinate, it may be advisable to fix the buttocks close together by a wide piece of adhesive rubber strapping or soap plaster, so that the prolapse is mechanically impossible.

The diet should consist chiefly of milk, egg, and beef tea; coarse bread, oatmeal, fruit, and vegetables, should not be allowed, and all food should be given cold. Even in the worst cases I have never found it necessary to resort to the use of nitrate of silver, the cautery, or any other heroic treatment.

If the prolapse be due to intestinal or vesical irritation the line of treatment is obvious, and in every case a look should be given to the condition of the prepuce and the urethral orifice (page 342).

Polypus is associated with great irritability of rectum and bladder; the child strains and cries at stool, and often passes nothing but a little blood and mucus. The vascular growth may be attached to the wall of the bowel by a pedicle of sufficient length to allow of the escape during defecation; it is then tightly grasped by the spasmodic contraction of the sphincter, the sensory nerves at its base are dragged

upon, and the boy screams with agony. The mother examining for cause of the distress may catch sight of the polypus, if it have not already been drawn up again. She may correctly describe it as being of the size and colour of a ripe cornstalk or cherry.

Even without the mother having seen it the history is almost indicative: The frequent going to the closet, the bleeding, and the agony when the polypus has protruded and been caught by the sphincter. Many of the symptoms are those of vesical calculus.

With prolapse of the rectal lining the anus is dilated, but in the case of polypus it is in a condition of habitual and spasmodic contraction, so that before making a digital exploration an anæsthetic should be administered. In every case of bleeding from the rectum, methodical search should be made for polypus; it is so movable on its slender stalk that it may be taken for a freed nodale.



FIG. 47.—Rectal Polypus.

Treatment will consist in dilating the anus, pulling down the polypus and tying its pedicle tightly with a strong waxed ligature. Unless quite small it is not advisable to tear it off with the finger nail when the bowel is being explored, as troublesome hemorrhage may arise from its artery.

Anal abscess.—Suppuration is usually superficial, and begins in gland tissue about the external sphincter. Though the neighbouring parts may be red and angry, they soon quiet down after the pus has escaped, and the short fistulous track closes up without further trouble. This simple condition is altogether different from that of

Ischio-rectal abscess, which may arise without

definite reason, or may be caused by a piece of bone which has been swallowed and passed through the wall of the bowel. The sooner that the tension of the inflamed tissues is relieved the better; one must not wait for fluctuation, but with a finger in the bowel as a guide, the knife is thrust deeply into the mass. **Fistula-in-ano** results, for which the ordinary operation will be eventually required; the parts should have quieted down before the external sphincter is divided.

In connection with the **treatment** of **fatala-in-ano**, certain cautions may be given. It must be ascertained that the sinus is not associated with chronic bone disease. Spinal abscess occasionally finds its outlet through the ischio-rectal fossa (page 337), in which case a probe may pass an indefinite distance into the interior of the pelvis. Or a soft flexible bougie may be directed towards the various vertebrae. The skin looks dusky and undermined, and with ordinary care it is hardly likely that a subject of the condition would be submitted to operation. These questions should be satisfactorily answered: has the child with a deep fistula a stiff or encrured back? has he disease of the sacro-iliac synchondrosis (page 431)? is he tubercular? Even without disease of joint or bone the tubercular child may be the subject of anal fatala, and to subject him to a cutting operation might be to hurry on a fatal result. The tuberculous nature of anal fatala must always be suspected.

Condylomata are large and soft; they grow in crops near, not at, the sinus. The neighbouring skin is moist, and probably similar tubercles are to be found in other regions. For treatment, see page 26.

Nervus of the rectum may be associated with serious hæmorrhages. To obtain an adequate view of the vascular mass a speculum should be introduced, the child being under chloroform. It is best treated

by the thoracic-aster. (See page 129.) Hemorrhage must be arrested by plugging with strips of lint saturated in an astringent solution.

CHAPTER XXII.

INTESTINAL OBSTRUCTION.

INTESTINAL obstruction may be acute or chronic. In the former variety the child is suddenly taken with vomiting, and has pain across the umbilical region. He cries out or screams with pain, and may even be attacked with convulsions. The pain may be subject to intermissions and paroxysms. The abdomen quickly becomes distended and tender. The diaphragm is pushed up, and respiration rendered short and difficult. Collapse comes on quickly, and, unless relief be afforded, death is almost certain. A history such as this leaves no room for doubt as regards the diagnosis; the symptoms are exactly those which would assert themselves if the intestine were strangulated in the inguinal canal or scrotum.

From the commencement of the distress no motion or flatus may have been passed, though the bowel below may have emptied itself soon after the first attack of vomiting. There may be scanty dejections of feculent mucus even after the occurrence of strangulation. Either with or without urgent or evident straining, mucus tinged with blood, or blood alone, may be voided; sometimes blood is passed in considerable quantities. If the strangulation be high in the small intestine, it is possible that extravasated blood may tinge the mucus vomit, though during life it might not be possible to say whether this comes

from the stomach or the engorged capillaries at the strangulation.

At first the matter vomited will be the contents of the stomach, and later on the bile-stained contents of the duodenum; still later the vomit will be feculent. Probably the sickness is the direct result of the shock to, and continued irritation of, the sympathetic system, just as it is by shock to the solar plexus that a boy struck in the "pit of the stomach," when at play, is attacked with vomiting. That there is in both cases a serious impression made upon the sympathetic system is evident from the amount of the collapse.

Causes of acute strangulation.—A terminal piece of the ileum may be invaginated into the cecal end of the colon, or there may be invagination in the small intestine itself, or in the large intestine. There may be a twist of the small or large intestine, or a piece may be caught and compressed by a diverticulum or other abnormal band or adhesion, probably the result of fatal peritonitis. (See page 262.) Sometimes not only does a piece of the ileum pass through the ileo-cecal valve into the colon, but the cecum itself, and some of the ascending colon, are carried into the transverse arch of the colon, or even down to the rectum, and out of the anus. In this condition a tumour may sometimes be made out by digital examination through the abdominal walls, the patient being under the influence of an anæsthetic, and the trunk well flexed. Such tumour would be firm and sausage-shaped, and might be found in almost any region of the abdominal cavity. The colon, in childhood, is very loosely attached.

Invagination may be due to the irritation set up by a polypoid growth in the bowel, or by some diverticulum, or it may be due to an exaggerated peristalsis set up by diarrhea, or by the presence of intestinal

worms, or some other irritant. More than one invagination may exist in the same child.

Invagination is frequently met with in the bodies of children who have died of various diseases, and wholly independent of any symptoms of disorder of the bowels during the patient's life-time (West).

Even an infant may be the subject of acute internal strangulation; often the patient is under two years of age, and very often under six months. The higher in the canal that the strangulation occurs, the less will be the abdominal distension, but the sooner will collapse supervene. In almost every case vomiting comes on at the moment of the strangulation taking place, or very soon after its occurrence. The constant vomiting, the dread of swallowing even simple fluids, and the sympathetic irritation combine to diminish the amount of renal secretion. When the strangulation is at the ileo-cæcal valve, a firm, abnormal mass may possibly be detected by palpation, deep in the right iliac fossa, but when the abdomen is tightly distended by inflated bowels, palpation can hardly be of service. The distension may be diminished, however, by puncturing the bowel through the abdominal wall with a fine canula and trocar. Examination by the finger in the rectum must always be made; possibly it may reveal an intramucosal mass of large or small intestine. The ordinary situation of hernia must be explored, and enquiry made as to whether the child had been the subject of hernia. If left to itself, the invaginated piece of intestine may, in the course of a day or two,



FIG. 38. — Invagination of small intestine.

become so swollen and agglutinated as to be incapable of readjustment; the opposed serous surfaces adhere so firmly, that, if by good fortune the strangulated knuckle should slough off, the continuity of the tube might become re-established, and recovery take place. As in external strangulation, gangrene of the bowel may rapidly supervene.

Considerable pieces of invaginated bowel may be happily cast adrift and discharged per anum, even the caecum cecum coli, and some of the small and large intestines have so passed, and the child has recovered.* But for a surgeon to stand by a child, in whom he has confidently diagnosed the existence of an invagination, and to hope for such a result, is, to say the least, impracticable.

The report of an instance of spontaneous recovery would attract much attention, whilst very possibly fifty children might have died of unrelieved strangulation without special record being made. Thus nature becomes accredited with a power of working a cure in internal strangulation, which, if misapprehended, is likely to involve grave disappointment.

The **treatment of acute strangulation** has hitherto, it must be confessed, been extremely unsatisfactory. It has comprised the administration of purgatives, opium, and other sedatives, and various emetics; inflation of the bowel by the use of common bellows; massage, under chloroform, either with or without inflation or opium; bountifications; and lastly, abdominal section.

These various means will now be considered one by one. First, as regards the use of purgatives. A child is playing with his fellows, when suddenly, and from no apparent cause, he is attacked with violent sickness, and complains of great pain across the

* For cases, see Mr. Halckeson's paper, to which reference is made farther on.

region occupied by coils of intestine and ramifications of the solar plexus.

The administration of purgatives could but add to the local and constitutional distress, and as anything taken by the mouth produces a fresh attack of vomiting, food and stimulents can be given only by small enemas; only a little iced water can be kept down. From the moment that internal strangulation is diagnosed, every purgative must be withheld. The bowel demands rest, and this is best obtained by the liberal administration of opium by the mouth. But though this drug may mask the symptoms, it cannot remove their exciting cause. It is useful in that it checks the vomiting, quiets peristaltic action in the bowel, and eases the patient; but it will be harmful if it causes the surgeon to regard the patient's condition in a less serious light. The improvement which it effects is apt to be specious, and the relief and sleep obtained by its administration must not be misinterpreted. It should be given until the child is brought fully under its influence, but it must be withheld as collapse approaches. What is wanted, in all such cases, is rest. Treves bears testimony to the value of opium: "There is certainly no one drug of more use in cases of intestinal obstruction. It can dull the severe agony that often marks the earliest stages of acute strangulation."^{*} He has no doubt that in many severe instances a death early in the case has been averted by the timely use of opium.

Copious enemata of warm water, or distension of the bowel by air pumped per anum by a pair of bellows, may, in rare instances, have produced the effacement of an obstruction, especially if the child have been inverted at the same time that the abdominal walls have been gently but firmly kneaded (the child being, of course, under the influence of an

* "Intestinal Obstruction" (Jacksonian Prize Essay 1887).

anæsthetic). But if under inversion and manipulation a tumour, which was evident previously, have now disappeared, it must not be concluded that the strangulation is relieved; the mass may simply have hidden itself behind coils of inflated intestine.

To be successful, this kind of treatment must be employed before the opposed segments within at the invaginated region have had time to become adherent. For this purpose, it might be employed during the first twenty-four hours, and not later than thirty-six hours from the onset of vomiting. When once tried, there should be an end to the method. If it fail to do good, it is likely to do harm to the inflamed tissues, by disturbing and wounding them. The cases in which it may possibly be of avail are those in which there is invagination of the small intestine into the large, but fluid cannot pass back through the ileo-cæcal valve to effect an invagination in the ileum or jejunum.

Dilatation of the bowel, by whatever means effected, should be performed with the greatest care and delicacy. If the child be inverted, the oil or water may be allowed to enter the bowel by a flexible tube, through a funnel raised a few inches above the buttocks. The bowel, especially if softened by inflammation, might easily give way under the pressure produced by the use of a Higginson's syringe, whilst a slender tube would probably coil up soon after entering the sigmoid flexure. Little trust should be placed in the treatment by dilatation; rather might one pin one's faith to the employment of opium, and the induction of perfect rest and quiet. Probably the time will come when the treatment of acute obstruction by copious enemata will be regarded much as one now views the old treatment of strangulated hernia by hot bath and resection.

Fomentations by flannel under oilskin will

give some relief, but cannot influence the strangulation. Laudanum may be freely sprinkled upon the flannels.

Abdominal section is the only method of active treatment on which reliance can be placed, and its performance is demanded in every case where the diagnosis of acute intestinal obstruction has been made. This operation is for internal strangulation exactly what herniotomy is for external strangulation. That its adoption has not hitherto been attended with excellent results must be admitted, but not to the prejudice of the operation. Almost invariably, it is resorted to only when the child is in the very condition from which a bolder policy might have rescued it. That the operation of abdominal section does not in itself entail a great risk is evident when one sees with what success ovarian tumours may be dealt with; the scrupulous cleanliness of modern surgery has banished much of the dread which was inherited from previous generations of surgeons, of opening the peritoneal cavity. Probably the chief reason of abdominal section being regarded with such disfavour in the case of acute internal strangulation is, that it is not resorted to early enough. To have delayed an operation for the relief of a strangulated inguinal hernia until peritonitis had made its appearance, and the patient had become exhausted from sickness and distress, and the adoption of various speculative measures, would have produced statistics for herniotomy very different from those which we are now able to show; and it will only be from a proper recognition of the analogy between the internal and external strangulation that the surgery of the former condition can advance.

Though a strong advocate for the treatment by opium and rest, Theiss admits the following to be *indications for resorting to abdominal section*—If the pulse early continues rapid, or late becomes so, its

rate and volume being only slightly improved by the administration of opium; when the tongue has the typhoid appearance; when thirst is intense, and vomiting occurs more than four times in twenty-four hours.*

The account of a case in which abdominal section was successfully performed by Marsh, for intussusception in an infant seven months old, is recorded in volume lix. of the Transactions of the Medical-Chirurgical Society.

Case.—Fourteen days previously the infant had been seized with diarrhoea, sickness, and occasional griping pains; tenesmus supervened, and the motions contained mucus and blood. Then a mass of bowel, in which was clearly seen the ileo-cæcal valve, protruded from the anus. Chloroform was administered, and futile attempts were made by insufflation and by the injection of warm water into the large bowel to reduce the invagination. A sausage-like tumour could be felt extending from the left of the umbilicus down into the pelvis. An incision two inches long was made in the linea alba, just below the umbilicus; the entering piece of bowel was happily drawn out of its sheath; the wound closed with hare-lip pins, and, under the influence of opium, complete recovery was quickly obtained.

Marsh is of opinion that if the diagnosis be certain and other means have failed, the operation ought to be at once performed. That it ought to be performed *first*, in cases in which strangulation is acute and quite recent, that is if not more than twelve or eighteen hours' duration; *secondly*, in cases which are chronic, and in which there have been no symptoms of inflammation or strangulation. The only qualification which I would venture to make to this is, that the "other means" (by which are probably

* "Intestinal Obstruction," p. 558. 1861.

ment insufflation and injection of warm water) be given but scant attention, and that abdominal section be regarded as the only measure likely to afford relief.

A similar case is described by Hutchinson, in volume lvi. of the *Transactions of the Society*, in which the operation of abdominal section had a successful issue. The symptoms were not those of acute strangulation; they had come on rather suddenly about a month previously; a fortnight before the operation a piece of bowel had appeared through the anus; this the child was constantly straining to eject from the rectum. Warm water enemata were tried in the usual manner, but without avail; and Hutchinson remarked* concerning the artificial distension of the bowel: "My experience of several other somewhat similar cases, all of which had resulted in death, after patient and repeated attempts by the injection plan, did not encourage me to expect success in this."

The operation consisted in making a short opening into the abdomen just below the umbilicus and in drawing out the entering piece of bowel. The wound was closed with pins and sutures; and cotton-wool and strapping were used as the dressing. The reduction was easily accomplished, as the parts were not adherent or even inflamed. In this paper other cases of intussusception in children are recorded, and special reference is made to the importance of carrying out a thorough digital examination of the rectum in all obscure cases; and also of distinguishing an intussusception from a mere prolapse of the lower bowel.

The **operation** should be performed in the linea alba in those cases in which a tumour is to be made out in the middle line or to the left of it; but if the

* *Loc. cit.*, vol. lvi., p. 35.

may be clearly made out, and be fixed in the right iliac fossa, the peritoneal cavity may be opened by a curved incision near the front of that iliac crest. Though the abdominal wall is thin in that region, the cavity cannot be reached with so much convenience as through the single fibrous layer of the linea alba. With a tumour in the right iliac fossa, there is almost certainly invagination through the ileo-cæcal valve; when the tumour is in the left fossa it may still be invagination through the valve, but it had better not be sought through the left groin, lest, if an artificial anus have to be made, the ascending colon be dragged a needless distance across the peritoneal cavity. The median incision serves best. Every necessary precaution must be taken, and whether the spray be used or no, the truth of Savery's dictum, that "every careful surgeon is an antiseptic surgeon," must receive sincere and practical recognition.

The incision in the middle line below the umbilicus should not be longer than may be necessary for the admission of two or three fingers into the peritoneal cavity, otherwise the operation may be impeded by the ready escape of distended coils of intestine. If the tension of the bowel be very great, careful puncture may be made with a fine cannula; the puncture wound thus made would not require treatment. In opening the peritoneum, care must be taken that a distended piece of bowel do not start up and damage itself against the knife.

If no tumour, band, or twist be discoverable when the cavity is opened, the fingers may be directed beneath the distended coils which lie in the right iliac fossa; then the left side may be explored. If still no strangulation be met with, the empty coil may be followed upward until the fault be reached. If this be of the nature of a band, it must be secured between two pairs of compressive forceps and

divided; a *sacculoid* must be carefully unfolded; in short, the strangulation must be dealt with as occasion may suggest. The wound would then be closed by sutures which include the peritoneum, and by finer superficial ones, and dressed with a pad of sublimate wool and kangaroo-tail binder.

The abdominal cavity having been opened the *cæcum* should be first exposed. If this be found empty, the obstruction will be in the small intestine, which must then be examined, care being taken that its coils be not allowed to protrude. If the *cæcum* be full, the colon must be traced along and then the *cecum* itself examined.

If an invagination be discovered it should be drawn up to the wound for examination, when, if from agglutination of the opposed surfaces of peritoneum the invaginated piece of bowel refuse to be drawn out, even when it is being helped back by manipulation on the outside of the encircling piece, it will be inadvisable to attempt the separation by rude force; such treatment would almost certainly cause an immediate or subsequent extravasation of the contents of the bowel.

If the adhesion be firm, or from any other cause a piece of the intestine be deemed untrustworthy, compression of the bowel above and below that part should be made, the damaged piece being excised. This important procedure should be conducted outside the abdominal cavity, the bowel being carefully clamped before being cut. Indeed, it may be clamped in two places at the proximal side and in two at the peripheral side of the portion to be removed, and the division made between each pair, the part being first emptied by the finger and thumb, so that the operator may not be embarrassed by escape of the contents.

The clamps, which practical experience has approved, may be made of stiff pieces of gum-elastic

catheter laid side by side with their ends firmly approximated by Indian-rubber rings or simple ligature. The protruding pieces of bowel may then be secured to each other and to the margin of the wound, by fine sutures which pass through the serous coat.

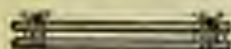


Fig. 48.—Improved Clamp.

The opening into the peritoneal cavity having been thus securely blocked, and the tissues well lubricated to preserve them from irritation, the clasp would be removed by cutting the elastic band or other ligature, and the contents of the bowel allowed to escape.

Absorbent wool under carbolic acid makes a good dressing; ice water should be the chief article of diet. If the child survive the operation, an attempt should be made on a future occasion to render the upper piece of bowel once more continuous with the lower.

Nutrient enemata in small quantities, and carefully prepared, may be administered with a view of keeping up the strength, so long as they do not appear to give rise to renewed attacks of pain, or set up irritation of the lower bowel. Should they be ejected directly, or shortly after they have been administered, the indication against their further employment is clear.



Fig. 49.—Artificial Anus, bowel clamped and sectioned.

Enterotomy is an operation for the relief of intestinal obstruction which has much to recommend it. It is a simple procedure and one which involves comparatively little shock or loss of blood. An incision of an inch in length is made through the abdominal wall a little above the line of Poupart's

Exposure, and the first piece of bowel met with is fixed to the margins of the wound and subsequently opened. Thus relief is at once afforded to the obstruction. If, as is expedient, the opening be made upon the right side, an inflated coil of the *Serum* is almost sure to be seized. No search is made in the abdominal cavity for the cause of the obstruction, the hope is that matters, whatever they may be, will right themselves. The over-distended bowel is paralysed; enterotomy ensures immediate evacuation, though it leaves the obstruction possibly unrelieved.

Lawson Tait has recently advocated the claims of this operation with great eloquence. Supposing that the case be one of intussusception, as it most likely will be in a child, the opening made by the surgeon may suffice to tide the patient over the crisis, and allow complete and successful separation of the invaginated piece of bowel by sneezing. If the cause of the obstruction be of a less serious nature, the operation may be expected to afford complete relief. Later on the wound might be closed. Thus the surgeon is not called upon to separate adhering coils of inflamed bowel, nor to disentangle friable involutions. Happy is he if the exact nature of the acute strangulation be never made apparent to him!

Case.—A female infant of two days was admitted on account of incessant vomiting; it had passed a trace of meconium. The abdomen was turgid; digital exploration under diaphanum showed the anus and rectum to be perfectly developed. As the obstruction was not absolute, a delay of twenty-four hours was advised with the view of giving nature a further chance. At the end of this time, the infant being worse, an opening was made, as described above, in the right iliac fossa. Immediate relief followed, but the patient sank six days later.

The autopsy revealed a matting of the intestines from old, intra uterine inflammation. There were no signs of tuberculosis.*

Chronic intestinal obstruction may be caused by the slow contraction of deposits left after peritonitis, by strictures at the junction of the pelvic and anal portions of the rectum (page 307), by imperfect development of the anus, or by invagination of the large intestine (see with this last condition the symptoms are not necessarily acute), by habitual constipation, or by the compression of some new growth. The prominent symptom is the smallness of the fecal evacuations, and the increasing difficulty of producing a free motion. The child becomes feeble, dyspeptic, and sick, and when the obstruction is at or near the rectum a doughy mass of hardening feces may be detected by firm pressure in the left iliac fossa. Above the stricture the bowel will become enormously expanded by accumulation, and ulceration of the thin wall may determine a rapidly fatal peritonitis. Sometimes the constipation is associated with a watery diarrhea, the result of irritation of the mucous membrane of the bowel. Chronic peritonitis may begin at and be confined to the neighbourhood of the obstruction, but it may in time become general.

A careful examination of the bowel should be made by the anus, and if an organic stricture be found it must be dealt with as suggested on page 307. Mild cases of obstruction may be trusted to recover without any interference (Thomas). If the cause of the obstruction be obscure, and the symptoms be increasing in severity, the **treatment** should be directed towards the quieting of the alimentary canal by the administration of small doses of opium. Purgatives must be avoided. The diet should consist chiefly of

* *Brit. Med. Journal*, June 12th, 1885.

iced water, milk, and beef tea, and if there be much sickness, the strength must be kept up by the use of nutritive enemata. If the rectum become irritated by these enemata, so that it cannot retain even a small quantity of fluid, it may be soothed by an occasional washing out with a copious current of hot water (Broadbent). In an obscure case of chronic obstruction the child may be judiciously submitted to the speculative treatment given on page 320, but if the obstruction have persisted many days this is unlikely to be of avail, on account of the probable existence of peritoneal adhesions. If the symptoms become worse it may be the duty of the surgeon to open the abdomen by a small incision (page 323), and explore, to search for and relieve the obstruction.

Hardened masses of feces in the sigmoid flexure may be softened by enemata of warm water and oil, and broken up by manipulation through the abdominal wall. The surgeon must personally administer such enemata; it is too important a matter to be handed over to a casual attendant.

Cæcitis. — Inflammation of the cæcum may be a primary affection, or it may be started by ulceration and perforation of the vermiform appendix. This may be caused by a pin or other foreign body in the appendix, by tubercular disease, or by chronic constipation. Inspection of hardened feces is a fruitful cause of the disease.

The inflammation is associated with local pain and tenderness, which, with paralysis of the bowel, tenesmus, and perhaps vomiting, may for a time lead to the suggestion that the case is one of obstruction of the bowel, due to intussusception of the ileum into the cæcum or colon.

Symptoms. — There are fulness, hardness, and persistent pain, and tenderness in the right iliac fossa. The bowels are constipated, and constitutional disturbance

is severe. The skin becomes red and shining. There may be discharge of mucus and blood *per anum*; a slough of the cæcum or appendix may thus be passed away, and still the child may recover.

In due course the inflammation extends to the connective tissue around the cæcum (*caps. cæci*); if hardness give way to a feeling of doughiness or even to obscure fluctuation, abscess may be suspected. Vomiting nearly always occurs in children; it was present in all of Meigs and Pepper's thirteen cases. "It is never stercostrœva, and, indeed, is rarely troublesome unless the constipation is marked, or perturbing treatment has been adopted in the beginning of the attack."*

If the perforation of the bowel occur in the wall of the cæcum before inflammation has set up firm adhesions to the surrounding tissues, a fatal peritonitis is the almost inevitable result; but if advancing inflammation should have glued the bowel to the abdominal parietes abscess may form in the iliac fossa, or become discharged through the groin without the general peritoneal cavity having been implicated. If suppurative peritonitis occurred it would be expedient to give the child the benefit of abdominal section, and irrigation of the peritoneal cavity and drainage.

Eschscholtz refers to instances in which pericæcal abscess has discharged itself along the inguinal canal and into the scrotum, into the rectum, on to the buttock or thigh. Or a cæcal abscess may burst into a neighbouring coil of intestine, when, if the adhesion from peritonitis prove firm, there may be no extravasation into the general peritoneal cavity, and recovery may follow.

The **prognosis** in cæcitis is by no means desperate. Indeed, if the treatment have been that of rest and opium from the beginning, and the abscess approach

* Meigs and Pepper, p. 476. 1882.

the skin over the iliac fossa, the chance of recovery is favourable. Sometimes the disease ends in resolution without abscess having been formed.

The **treatment** demands *absolute rest*; explorations, manipulations, and the administration of purgatives and emetics are all harmful. Nutrient enemata should not be prescribed; they excite the lower bowel. From the moment that a painful fulness has appeared in the iliac fossa, the child should be kept absolutely quiet in bed, and allowed but small quantities of easily-digested liquid food. Opium is to be constantly given in small doses. This, indeed, is the only drug in which any confidence is to be placed.

The acute peritoneal abscess is easily distinguished from the chronic paracyst collection of spinal caries (page 241). The skin over it is dusky and oedematous; and when gas has escaped into it from the ulcerated bowel, emphysematous crackling may be detected on palpation. The abscess should be opened without timorous delay; indeed, as soon as the presence of pus is definitely ascertained. The sooner to the iliac crest that the incision is made, the less the danger of opening the peritoneal cavity. Iodoform dressings and pads of lanax form excellent dressings. The cavity should not be distended by irrigator or syringe.

CHAPTER XXIII.

THE TESTIS AND ITS COVERINGS.

AT an early period of development there is nothing in the structure of the internal organs of generation to indicate to which sex the future would eventually belong. The testis or ovary is placed in the renal region to the front of the Wolffian body. The testis

reaches the internal abdominal ring at about the seventh month. During the eighth month it is in the inguinal canal, and at birth has generally reached the depths of the scrotum.

The descent through the external abdominal ring may be delayed for some days or months after birth, or, appearing now and then outside the ring, the gland may as constantly be retracted. A testis which lingers in the canal or at the ring may be encouraged by well-directed and frequent manipulations to complete its descent. But if the gland have permanently attached to itself a piece of bowel it will be a question whether it should not be imprisoned within the abdomen by a truss. The testicle which long delays its descent is apt at last to appear in close company with a piece of bowel; probably the adhesion was the result of limited peritonitis. If there be a congenital hernia, and the testis of that side have not made its appearance, one will be disinclined to advise the permanent wearing of a truss, lest the late descent of the gland be prevented; for at or just after puberty the healthy testis may make its complete descent.

Displaced testis.—Though the testis have left the abdominal ring, instead of passing into the scrotum it may wander into the groin or perineum. Beyond the limits of the deep layer of the superficial fascia of the groin and perineum it is unable to stray. It is not certain that a testis which has thus failed to complete its intended course will eventually be valueless; unless its presence in the abnormal site be attended with discomfort it may rest undisturbed with. A testicle in the perineum might eventually preclude its possessor from horse exercise, and, if injured, might demand ablation, but it is questionable if the risk of the operation of transplantation to the scrotum should be advised.

A testis has been known to leave the abdomen by

the femoral ring, and to reach the surface of the thigh through the saphenous opening. (I have operated upon a woman in whom the ovary had taken this unusual course.*) If there be any doubt as to the nature of a small, firm, and oval swelling in the neighbourhood of pubes, perineum, or Poupart's ligament, the scrotum should be examined with reference to the presence of both testes.

If one gland be absent the finger should be made to sweep with firm pressure down the course of the



Fig. 51.—Schemes showing descent of Testis behind Peritoneum.

Fig. 52.—Tunica Vaginalis, connected with Perineum, &c. by Fibrous Thread.

inguinal canal; this may suffice to bring the lingering testis to within the grasp of the finger and thumb. If the testis, relaxed down from the ring, be inclined to ascend again, the pad of a truss might shut off its return.

Hydrocele is often associated with hernia. Fig. 51a shows the testicle behind the peritoneum in its passage into the inguinal canal. Fig. 51b shows it in the scrotum behind the *sac-de-mac*, which is to persist as the *tunica vaginalis*. In Fig. 52 the *tunica vaginalis* has separated.

Obtiteration of the tubular prolongation should take place soon after the testis has passed into the

* *British Medical Journal*, 12th December, 1873.

scrotum; a slender fibrous cord then connects the peritoneal sac with the tunica vaginalis (Fig. 52).

In some animals the tabular canal persists between the abdominal and scrotal serous sacs, and even with its shutting off the latter sac may be long delayed. Thus serous fluid mounting the peritoneal cavity may gravitate into the tunica vaginalis, a **congenital hydrocele** being the result. The fluid can be emptied into the abdominal cavity by placing the patient on his back, and raising the scrotum; but on lowering the pelvic region the fluid trickles down again. If the spermatic cord be then loosely pinched at the external abdominal ring, and the scrotum squeezed by the other hand, the fluid may be felt gurgling up along the narrowed passage. If, when all the fluid has been returned, pressure at the ring be remitted, the fluid will again descend.



Fig. 52. — Congenital Hydrocele. L. Todd.

This examination shows that scrotal fulness is due to serum, not to intestine. In the latter case the descent would have been staid and massive. Congenital hydrocele and hernia (page 344) often co-exist, and in the case of only a slight scrotal fulness in a little child the test of transparency may be impracticable. In employing it the room should be darkened, the front of the scrotum scroted by the hand, a lighted taper or candle held on the other side of the scrotum, and inspection made through the tube of an old-fashioned stethoscope, or by means of a sheet of paper rolled up so as to leave a lumen of about the diameter of a cedar pencil.

The size of the opening through the narrowest part of the funicular protrusion may be no larger than a goose quill. Its complete obliteration is desired, lest,

under the influence of fluid pressure, or during an attack of vomiting or coughing, it allow of the descent of a knuckle of intestine. The aperture may be so slender as to induce the surgeon to regard the occlusion perfect. To inject such a hydrocele, with a view of producing a radical cure, might be to set up fatal peritonitis. Obliteration may be best accomplished by the constant pressure of a well-fitting truss.

If the hydrocele be so large as to interfere with the truss, the fluid may be drawn off by a fine, clean cannula. Or it may disappear by extravasation into surrounding tissues through punctures from an ordinary sewing needle. If the punctures be made rapidly they are almost painless; they probably have a stimulating effect upon the tunica vaginalis, and restore the balance of secretion and absorption, after the manner of electrolysis.

Congenital hydrocele requires less surgical interference than is sometimes lavished upon it. With the help of a truss it will almost certainly disappear. Parents generally regard the tumour with apprehension, and urge that something be done for it. In such circumstances a weak solution of iodine may be painted on the scrotum; this can do no harm. Lotions of spirits of wine, oil *assafoetida*, and other drugs, have been recommended. They render the parts wet and uncomfortable, whilst their therapeutic value is doubtful.

But if, after prolonged trial of the truss, the hydrocele do not diminish, the propriety of an operation, on the principles of that for the radical treatment of hernia (page 348), might possibly be considered.

In **funicular hydrocele** the tubular prolongation of peritoneum has been shut off from the upper part of the tunica vaginalis, whilst its communication with the peritoneal cavity persists. In this variety the testicle will be below the hydrocele.

In **infantile hydrocele** the fluid collects in the tunica vaginalis, and in the funicular process, communication having been cut off from the peritoneal cavity.



Fig. 34.—Hydrocele of Tunica Vaginalis and of Funicular process.

The tumour is pear-shaped, with the stalk extending up to, or even within the external abdominal ring. The swelling is transverse, and unyielding, no fluid escaping under pressure. Such a hydrocele should not be injected; the surgeon cannot be absolutely certain that the occlusion is perfect. The cyst may be occasionally punctured with a needle, or, if necessary, the fluid may be withdrawn by a fine canula.

Ordinary hydrocele of the tunica vaginalis is not so common in childhood as are the other varieties. It may get well with aspiration, or it may require one or two tapplings with a canula. Possibly it might require injection with a weak solution of iodine, but such cases must be of very rare occurrence.

Encysted hydrocele of the cord frequently escapes recognition; it is often met with in the surgery of childhood both in boys and in girls. My experience coincides with that of Holmes. "I have often seen children wearing trusses over such cysts." In feel and size they resemble a testis. At times they are so hard as to appear solid growths. If close up against the ring they must be drawn down for examination. Examination by transmitted light is impossible when the tumour is high up, and covered with fat.



Fig. 35.—Encysted Hydrocele of Cord.

A hard, rounded swelling above the testicle, and in

the course of the spermatic cord, can hardly be anything else than encysted hydrocele, so that when it has been steadied and fixed by the fingers and thumb, a fine canula and trocar may be thrust into it. But the surgeon must assure himself that the swelling is not associated with a piece of intestine; the external abdominal ring must be quite clear. About half a tea-spoonful of pale serum will escape, and the tumour will have disappeared, perhaps for ever, but the hydrocele may possibly require evacuation on subsequent occasions.

Encysted hydrocele in the canal of Nuck.

—Close below the external abdominal ring is a round, hard swelling, perhaps small enough to be pushed up into the inguinal canal, from which it will descend again, unaltered in size. On passing it down towards the labium it is found to have no definite connection with the interior of the abdomen. It may have been there for days or weeks as a hard, painless swelling. It is rarely large enough for examination by transmitted light. Puncture by a grooved needle confirms the diagnosis, and dissipates the tumour.

Acute orchitis may be the result of a kick or blow, or of sudden and forcible abduction of the thigh. In childhood it is rarely an associate of mumps.

Acute epididymitis may be due to some irritation or abrasion of the urethral mucous membrane, such as may follow on the escape of a vesical calculus, the passage of a sound, or after lithotomy. If the epididymitis be secondary to urethral irritation, the vas deferens will be found swollen and tender along the back of the cord. With acute inflammation of the testis or epididymis, the child will be in great distress, the scrotum being red and swollen. He should be placed upon his back in bed, and a full dose of castor-oil administered, and two or three leeches applied; quinine and iron may then be prescribed. Though the

acute inflammation is apt to be followed by atrophy of the gland, this would proceed slowly, and long before it was recognized the patient would probably have passed from under surgical supervision; this is due to pressure from effusion within the fibrous capsule; and it might be expedient to secure immediate relief to the tension by a few punctures by a grooved needle. The application of a lotion of lead and opium does not fully meet the urgent demands; leeches will be of great service. If the testis remain thickened from chronic inflammatory effusion, the scrotum may be strapped with adhesive rubber plaster, or covered with collodion.

Chronic strumous inflammation of epididymis or testis may appear even in early childhood, the affected part being extremely hard, nodular, and painless. If the disease begin in the epididymis it will spread to and implicate the spermatic cord and the body of the testis. Both glands may be affected. If the child be carefully fed and clothed, and cod-liver oil and iron be prescribed internally, andunctions of the oil externally, the hardness may disappear or health improve. The deposit may increase, and soften in places from cavitation, the scrotum then becomes adherent, the skin grows dusky, and is undermined and the debris is eventually discharged.

If the destruction of the testis be so great as to give little prospect of recovery, castration is needed. A miserable child has recently been under treatment for strumous orchitis, in which extensive sloughing of the scrotum took place, the testicle being left uncovered. The child quickly sunk.

Pungent granulations from the exposed testis are best treated by the powder of red oxide of mercury, the child being kept off his feet and brought under the influence of oil and iron.

Syphilitic orchitis is a rare manifestation of

hereditary taint; both glands may be affected, the swelling being for the most part even, regular, and confined to the body of the testis. Curling remarks that the treatment which he has found invariably successful is mercurial inunction. Small doses of iodide of potassium, or of iodide of iron, might be given if the mercury disagree.

Malignant disease of the testicle.—When the testis is growing rapidly into a large, oval firm, and comparatively painless mass, sarcoma or encephaloma may be suspected. The diagnosis may for awhile be obscured by fluid in the tunica vaginalis; but there is the hard mass which can be neither of blood nor serum. Exploratory paracentesis is useful in confirming diagnosis; it can do no harm.

If the disease be allowed to run its course, the scrotum will be involved, and a fungating mass will start through the ulcerated or sloughing skin, the child wasting rapidly and dying exhausted. Castration at the earliest moment holds out the best hope of recovery, but even this treatment is often followed by disappointment, deposits being usually found post-mortem in the lumbar glands, the lungs, or other internal organ. The enlarged glands may almost fill the abdominal cavity. If the course of the life be measured by a few short months there may not have been time for much glandular implication.

Of the two diseases, sarcoma (page 113) is of more frequent occurrence. Before the microscopist began to differentiate between the two forms of malignant disease, a rapidly growing and gland-infecting mass was generally called cancer. But the rounded mass implicating the testis of a child, and causing enormous secondary deposits in the abdomen, is almost certainly a sarcoma. Sarcomatous infiltration may be observed at, or directly after, birth. Mr. Sibcock showed a specimen of such congenital affection at a

meeting of the Pathological Society of London in April, 1855; Mr. Parker, on the same evening, exhibited a similar preparation.

For the most part, when a testis is hard, painless, and steadily increasing in size in spite of treatment, castration is required, and the sooner that it is done the better. The child who has been previously pale and fretful, who has been losing appetite and growing thinner, may at once improve when the diseased gland is removed. Delay affords time for secondary implication of the lumbar lymphatic glands.

Operation.—The child having been anaesthetised, the scrotum and adjoining parts are washed over with a weak solution of carbolic acid, and an incision is made from near to the external abdominal ring down to the base of the scrotum. For this purpose the integuments are pinched up between the finger and thumb, and transfixed; the cord is laid bare, and, with the testicle, is raised from its bed. A trust-worthy carbolised ligature is passed around the entire cord and firmly tied. A simple reef-knot should not be used, as the gut is apt to come untied; the knot should be supplemented by an extra half hitch. The spermatic cord is then cut below the ligature and the testicle removed. Having seen that there is no bleeding, the ends of the ligature are to be cut at a little distance from the knot, and the wound washed with a solution of corrosive sublimate and closed. A small drainage tube is laid along from the bottom of the wound, and the edges brought together by a continuous suture of fine gut. A dry dressing of iodoform, salicylin, or sublimate wool is applied; the thighs are tied together, and the knees bent over a pillow. Small doses of lardatum may be required, and wine if there be much depression. The drainage tube should be changed for a smaller one next day; the less that the wound is disturbed the better.

The ligature should be tied well above the testis, and if the vas deferens or the lymphatic tissue of the cord be thickened, the higher the spot at which the knot is placed the better. Sometimes it is necessary to pull the cord from within the inguinal canal, the knot being afterwards drawn up out of sight. It is inexpedient to tie the cord in two pieces; and to leave the ends of the ligature protruding from the wound is undesirable, as it delays the complete healing. If the case were associated with congenital hydrocele or hernia, the ligature of the funicular process of peritonæum would effectually shut it off from the peritoneal cavity.

Dermoid cysts may contain bone, hair, or other strange material; they would probably be noticed soon after birth. The tumour would be hard, painless, and irregular in shape; the mass is apt to undergo suppurative inflammation. The treatment available is ablation, and if in the course of the operation the testicle were found but imperfectly connected with the mass, absolute castration might not be demanded.

CHAPTER XXIV.

HERNIA.

THE subject of umbilical hernia has been already dealt with (page 262).

General remarks.—It is well to regard a hernial protrusion as the result of some abnormal condition rather than as a pathological entity. The theory will not always hold good, but in the long run it will be found to afford an excellent working hypothesis. It is the instrument maker who says, "If the child be ruptured he requires a truss."

Information should be obtained as to the circumstances in which the "rupture" first appeared, and what is now most calculated to bring it down. In one case the hernia first descended during a fit of vomiting, and now after every meal the child is sick and the tumour appears. Thus the treatment must be directed to the feeding of the child. If he be at the breast, is he allowed to overfeed the stomach? How often is he fed? If the reply be, "I give him the breast whenever he cries, and I let him have as much as he will take," the mother is to feed him at regular intervals, and for a limited number of minutes by the clock. Each case must be treated on its merits; and the more precise the directions given the more likely they are to be attended to. If the child be brought up by hand, attention must be given to the nature of the food, the bottle used (see page 8), and the manner of feeding. Violent expulsive efforts must be checked before the child can be cured of the hernia. If the hernia comes down with coughing, medical aid will be required. A long uvula may be the cause of either coughing or vomiting.

With some children the hernia appears during micturition: are the preputial and urethral orifices free? is a long or adherent prepuce keeping up peripheral irritation and making the subject strain? is there a vesical calculus? (page 243). Diarrhoea, chronic constipation, and also rectal polypus (page 213), may cause a hernial protrusion, or retard its permanent disappearance. A child should not need to strain at defecation, nor should he be allowed to sit long upon the vessel. If the child be premature, or badly developed, he must be kept warm, and rubbed with cod-liver oil.

To apply a truss to an infant is very likely to cause excoria, excoriations, or pressure sores, either in the groin or where the band of the truss passes across

the lumbar spine. On the pad of the truss, wetted with crease, is hard and discomforting. Many a hernia goes well in the first or second year of life without truss or special treatment, and if a careful supervision be kept over the little child with congenital hernia, he may do without a truss if possible. But if a truss be applied, care must be taken that it fits, and a second must be kept in reserve; frequently one has found the truss so adjusted as to allow the escape of the bowel, and to exert pressure upon it afterwards. A badly fitting truss is far worse than none.

If a congenital hernia have not disappeared whilst the child was always in the mother's arms, or in the cradle, it will possibly get worse as he begins to run about, so that a truss must be obtained. But when he is running about it is more difficult to find a truss that will keep the bowel always up. When the truss is applied for the first time, or a new one is being worn, the child should be kept much in the recumbent position, so that the pad may have the opportunity of settling well down to its work. Sometimes the pad is so small and conical as to press into, and even keep open, the abdominal aperture, and, as a rule, the spring is much stronger than necessary. If, except under pressure, the hernia be constantly down, the truss must be worn continuously, night and day; but if it come down only on exertion, it need not be worn when the child is in bed, though it must be readjusted before he gets out of bed. The skin beneath it should be carefully washed and dried, and dusted with violet powder at least twice every day. If any excoriation appear the truss must be taken off, and, if advisable, the child sent to bed until the place is quite well again.

In the choice and application of a truss too much should not be left to the instrument maker. He views the matter from a purely mechanical standpoint, and

he rarely has anatomical or surgical knowledge to enlighten him. Often when the hernia is associated with a hydrocele, the steady pressure of a truss may cure both; but if fluid interfere with the pad it may be withdrawn before the truss is applied, care being taken that no bowel is in the sac.

Congenital hernia is that variety in which the bowel passes along the open funicular process



FIG. 36.—Congenital
Hernia.

T. TUBE.

and down into the tunica vaginalis. (See remarks on congenital hydrocele, page 334.) Though it is often found at, or soon after birth, its appearance may be delayed for weeks, months, or even years. Frequently it exists with congenital hydrocele, when, on the bowel being returned into the abdomen, the serous fluid can be made to follow it by raising the scrotum. Sometimes the bowel descends only a short way down the funicular process, when, if there be no hydrocele,

it may be impossible to recognise the exact variety of the hernia, a matter of little practical importance.

Congenital hernia may occur in girls as well as in boys; in the former the intestine drops into the funicular process, which passes down with the round ligament, the canal of Nuck. In one child sent to me by Dr. Barlow, the ovary had thus descended as a hernia on each side of the body. Most of these cases will get well of themselves if the child be properly cared for, but if expedient a truss may be applied.

Except in the case of the trunk ovary, nothing but small intestine is likely to be present in a hernial

sac, for in childhood the omentum but thinly shadows forth its future greatness. On account of the loose connections of the lengthy mesocolon, the cecum or the sigmoid flexure may, however, have descended.

In **funicular hernia** the bowel has descended along the open tube of peritoneum, but on account of obliteration of the process having already taken place just above the testicle, it has not, as in the congenital variety, passed into the tunica vaginalis. Birkett is probably correct in considering this a common variety of hernia in infancy.

Infantile, or encysted hernia, is of rare occurrence; its exact nature could hardly be recognised, except on opening. The tubular prolongation of peritoneum has been obliterated at the internal abdominal ring, whilst the tunica vaginalis and the funicular portion remains in free communication; an expulsive effort drives the bowel in a special sac, and into the open funicular process and tunica vaginalis.

Case.—A weakly male child had a small, tightly strangulated hernia of the left side; it reached half way to the testis. The child was very ill; the hernia could not be reduced under chloroform. A diagnosis was made of "congenital hernia," but, on opening the sac, a second sac was seen; at the bottom of the opened sac lay the testicle. After a slight use of the hernia knife, at the top of the tunica vaginalis, the contents of the small sac were returned without being exposed. On the eighth day death occurred from



Fig. 22. Encysted Hernia.

T, Testis; P, tunica vaginalis.

pneumonia; the preparation is in the museum of St. Mary's Hospital (No. C. d. 30.)

There is a **second variety of infantile hernia** in which, the funicular process being closed at the abdominal end, but opening into the tunica vaginalis, a piece of intestine passes down in a sac behind the tunica vaginalis, instead of into it. It would be necessary to cut through three layers of peritoneum before reaching the bowel (Fig. 58).

Trusses should not be made too strong in the



Fig. 58.—Hernia behind
T, Testis; TV, tunica vaginalis.

spring, or pain and ulceration will be set up. The pad should not be conical, but should fall flat over the ring, and press upwards and backwards. A small pad which presses into the aperture is manifestly bad. The truss may in many cases be left off at night, but should be reapplied before the child is allowed to get upright. A piece of soft linen sewn evenly over the band and pad gives great comfort. For the bath, a truss lined with india-rubber may be used, but the

spring must not be too severe. If the skin get sore, the child must be kept in bed for awhile, or at any rate prevented from running about.

Radical treatment of reducible hernia is a preferable term to "radical cure." It is by no means always a cure, and as to speak of the operation is to surround it with a species of attractiveness. A little boy was seen a short time since, in whose case the "radical treatment" had been followed with a result that was simply appalling; the protrusion could hardly have been worse before the operation than it was after it. It is more certain that a child will run a serious

risk from the operation than that the hernia will be cured by it. If, however, operation be undertaken, the surgeon should omit no precaution for diminishing the risk from sepsis. The child must necessarily and the neighbouring bandages by fecal and urinary evacuations, so that too great reliance must not be placed upon the dressings.

As a means of hurrying on the obliteration of a reducible hernia, it has been suggested that a small amount of alcohol be injected by a subcutaneous syringe around the external abdominal ring, with the view of causing thickening and subsequent contraction of the connective tissue. Warren, of Boston, has recently had success with the employment of injection of solution of oak bark. These plans are little likely to be followed by calumny, and might be adopted as a preliminary measure in cases which are not benefited by a truss. If the treatment fail, the more severe method may be recommended; it is highly inexpedient that a child should grow to manhood with the imperfection unrelieved.

The operation of radical treatment is rarely advisable before the seventh year, as the continuous wearing of a well-adjusted truss may be expected to effect great improvement in the growing child. Before operating, the contents of the sac should be returned, and the skin cleaned with an antiseptic solution. Instruments, fingers, sponges, and everything else should be clean beyond suspicion. A fine incision is made along the front of the cord, until the funicular process is reached. The coverings are disturbed as little as possible during the dissection. The serous process is freed, the vas deferens and the spermatic vessels being jealously protected from injury. The process is securely tied by a catgut ligature close against the general peritoneal cavity, so that no depression may remain upon the

abdominal aspect likely to encourage subsequent emigration of bowel. To effect this it may be necessary to lay open the whole extent of the inguinal canal. Just before this ligature the sac will be severed. If the sac be large and adherent, it may be better to rest content with its partial removal, lest a too extensive interference with blood vessels involve troublesome recurrent hemorrhage; only enough of the sac need be left to form a vaginal band to the testis. The funicular process being removed, the surrounding tissues become matted together by adhesive inflammation, and impede, if they do not entirely prevent, subsequent protrusion. The pillars of the external abdominal ring are approximated by two sutures of strong silver wire, twisted up tight and cut close. They are to be left permanently in the tissue; and so that they may have a firm hold upon the aponeurosis of the external oblique, they should be inserted at some distance from the margin of the ring. Catgut is not so trustworthy as silver wire for these important sutures (Professor Stokes, Irish Academy of Medicine, Jan., 1884).

The edges of the skin wound are sutured with carbolised cat-gut, and the part covered with a pad of iodoform wool, due provision having been made for drainage. If the Listerian method be employed it must be remembered that the dressings are apt to be soiled by urinary or alvine evacuations. Macnucara has recently operated on a series of cases of reducible hernia with the adoption of simple but strict measures in the dressing and after-treatment, and has met with no mishap. With a discretion as praiseworthy as it is unusual, he has refrained from publishing his results until time and experience have duly enabled him to form a trustworthy estimate of the value of the operation.

If the **testicle and bowel be adherent** in a case of reducible inguinal hernia, the subject may be

highly suitable for the radical treatment. Prolonged and aimless endeavour should have been made to coax down the testis and imprison the bowel, but the complication is an unsatisfactory one for the adoption of conservative principles. If, in the performance of the operation on such a hernia, the testicle be found fully developed and easily separable, it may be brought down and left in the scrotum. But if translation do not suggest itself, or seem impracticable, if the gland be undeveloped or of doubtful firmness, it had better be removed forthwith. In such a case, as Mitchell Banks remarks, the operation is likely to be attended with complete success, for, the testicle being removed, the whole of the peritoneal process and all the constituents of the cord are taken away with it; and, nothing remaining to occupy the inguinal canal, the external abdominal ring can be completely and permanently closed. The need of the subsequent adjustment of a truss will be greatly lessened, though it should be adapted for a while.

Appreciation.—Many cases of reducible hernia, which have defied years of treatment by truss, have yielded at once after the cutting operation. But children must not be subjected to it without having been first submitted to a full and sufficient trial by truss. Even after the operation has been successfully performed the child should be made to wear a well-fitting truss for six months or a year; this may not be necessary, but it is expedient. It will diminish the risk of a descent of the bowel spoiling the good result.

Statistics are apt to be fallacious; and though a large array of figures may show an excellent success for the operation (imperfect results or failures may somehow have escaped due recognition), many reports may have been hurried into publicity before the subjects had been allowed the test of time. Thus

is unfortunate and misleading. Certainly failures after the operation are to be met with, but this may be the fault of the operator or of the after-treatment. A careful supervision after the operation is of the utmost importance.

The "bag and baggage" policy alluded to under the heading of the adherent testis and hernia is specially a matter for consideration and report. I must admit, without prejudice, that I am inclined to regard it favourably; an undescended testis is a cause of constant anxiety to the parent, and it will be one of future annoyance to the subject, if, as often happens, it fail to complete its descent; moreover, its physiological value may be a matter of doubt. When this is associated with an intractable hernia, a cutting operation affords permanent relief, albeit at an important sacrifice.

If death follow on the operation of radical treatment of hernia it may be due to peritonitis, or blood poisoning; and though the chances of the contingency are small in clean and careful surgery, still, whatever the special treatment adopted, the occurrence is well within the range of possibility. If this fact be constantly kept in view, due attention will be paid to the simpler treatment, the knife and suture being reserved for those cases which are otherwise unmanageable. Thus the radical treatment will settle quietly down to its proper therapeutic level.

Spanton's method of performing the "radical cure" subcutaneously may be best described in various numbers of the *British Medical Journal* for 1880 to 1882, and in that of Feb. 7th, 1883, as well as in the *Transactions of the International Medical Congress* for 1881. By means of an instrument something like a cork-screw, which he introduces through the tunic of the inguinal canal, he effects a permanent blocking. The screw is left in position for a week or more.

Spanton is of opinion that in the hands of himself and others the operation must have been performed upwards of a hundred times, and without the record of a fatal result. In cases in which it has failed to effect a cure the condition of the patient has been rendered no worse by the procedure.

In discussing the subject of the "radical cure," Vincent Jackson expresses the opinion* that a place will always be found for Spanton's operation; and, considering its many advantages, this surmise is probably correct.

Inguinal hernia is rarely **strangulated**; this fact may be due to the tumour at the neck of the sac being soft and readily yielding. On one morning, however, two such cases were brought to the Hospital for Sick Children; the patients were sick and in great discomfort. We were able to return the bowel in each instance by steady taxis.

When a hernia cannot be retained, the child should be at once placed upon its back, the pelvis raised upon a pillow, and the knees tied up under the roof of a cradle so that the blood may be encouraged to drain away from the congested piece of bowel, a little ice in a bladder being suspended over the tumour; the child should be allowed nothing but ice by the mouth, or iced water. A few hours of this treatment generally suffices to secure the spontaneous return of the bowel. But if sickness and constitutional disturbance increase in spite of the treatment, chloroform should be administered and one deliberate attempt by taxis undertaken, with the understanding that if this fail a cutting operation must be then performed.

Herniotomy in childhood does not differ from the operation in the adult, but most likely the sac will be opened for the relief of the stricture in each case; this is due to the thinness of the wall, and to the fact of

* *Brit. Med. Journ.*, Feb. 7th, 1880.

strangulation most likely existing in the neck of the sac which was in progress for obliteration.

What should be done with the sac?—In the operation for strangulated hernia it will be impossible to excise the entire sac, for the tunica vaginalis forms part of it; but it would be well to remove it from the upper part of the cord and to put sutures deeply through it at the ventral end (page 348). It is advisable to draw together the sides of the inguinal canal by two deeply placed sutures of silver wire, so that the descent from the abdomen to the groin may be blocked by adhesions; the sutures would approximate the pillars of the external abdominal ring. It is undoubtful that the child be put into a hot bath for this time is lost, and nothing gained but that which can be far better obtained by the employment of an anæsthetic. The use of the hot bath implies more taxis and perhaps bruising of the bowel.

Femoral hernia is seldom met with, probably because the pelvis not yet having taken on growth, there is sufficient resistance in the tissues filling up the space below Poupart's ligament. A reducible hernia must be treated on those principles which guide us in dealing with an inguinal hernia (page 348).

I have recently had occasion to operate on a child for **strangulated femoral hernia**. Laura G., six years of age, was brought to the Hospital for Sick Children, for incessant vomiting and a tumour of the size of a small walnut just below Poupart's ligament of the right side. The skin over the swelling was red and slightly oedematous, probably from the effect of treatment before admission. The child's general condition was evidently extremely grave, and highly suggestive of enteric fever; sores covered the lips and teeth, the tongue was furred in the middle and red at the tip and edges. Under chloroform, no brief trial of taxis having proved unsuccessful, an

incision was made over the tumour, and, the sac having been opened, a knuckle of small intestine was found, dusky and oedematous from a tight strangulation of about forty-eight hours. A slight incision having been made at the fractured ring, the bowel was returned, and the thin piece of peritoneum which had played the part of the sac was stuffed in to block the aperture in the crural sheath; a drainage tube and a few sutures were used, and the wound dressed with dry lint; the patient made a steady convalescence.

CHAPTER XXV.

LATERAL CURVATURE OF THE SPINE.

LATERAL curvature of the spine (*scoliosis*) is not a disease; it is a local expression of a general enfeeblement. It is often found in the subjects of flat feet; and, like flat foot, is due primarily to a yielding of muscles and ligaments under superimposed pressure. It is found chiefly in girls who are physically weak, or in whom growth has advanced beyond strength and solidity. Such girls have often fallen into rolling habits when standing, or when sitting at meals, at the pianoforte, or at lessons. Boys are but little liable to the deformity, as they possess greater physical strength and keep their muscles and other tissues in a state of efficiency by out-door exercises. The children of the poor are much less affected with lateral curvature than are those of the upper classes, who take but little exercise and pass much of their time sitting.

Attention may first be called to the condition from the mother noticing that a hip or shoulder is "growing out," but as the child makes no complaint, surgical advice may not be sought until the

defectuality is but little amenable to treatment. In the early weeks of the deviation there is simply a yielding of feeble muscles and ligaments; but, later on, when the vicious habit is confirmed, the intervertebral discs and the bones become misshapen, and a peculiar rotation is produced.

In either sex lateral curvature may be secondary to collapse of lung tissue

(page 146), or to obliquity of the pelvis from congenital dislocation of a femur, or some other form of shortening of a lower extremity; one meets with instances in which the curvature has been induced by a child carrying about a baby; weakly girls should not be allowed to nurse heavy infants. Sometimes the curvature comes on after illness. The chief of the early symptoms are "back ache," lameness, and rolling and stooping, especially if a walk have



FIG. 31.—Lateral Curvature in a Rickety Child.

been long or lessons fatiguing.

Lateral curvature is not the result of abnormal muscular contraction. It is futile to endeavour to remedy the affection by subcutaneous division of muscle, tendon, or fascia which happens to assert prominence in the back.*

Before the bones are affected, the curvature is amenable to treatment; afterwards it is incurable. But even then further deformity may be prevented

* See "Diseases de l'Épine, traitement par la myotomie," *Gazette* (p. 92).

and relief afforded by the adoption of appropriate measures.

As a rule, the lateral deviation shows itself most markedly in the dorsal region, the convexity of the curve being directed towards the right, so that the scapula of that side is raised and prominent. Sometimes the angle of that bone is raised several inches from its proper position. An alternating curve is sometimes found in the lumbæ; indeed, this latter must be considered the primary one, that in the dorsal region having been needed to keep the centre of gravity within the base of support, when the child is standing. Sometimes a curvature exists also in the neck, this, like the lumbar curve, having its convexity towards the left. The curves are thus alternating. The alteration in the level of the scapula is not always an index of the amount of the lateral deviation, for with alternating curvatures in the lumbar and dorsal regions the shoulder blades are thrown but little out of the horizontal line.

A growing and weakly girl, standing much in class, finds that she can spare herself muscular fatigue by throwing her weight on one foot, whilst keeping the knee firmly extended, by advancing the left foot, and by slightly flexing the knee of that side. Thus she falls into the "stand-at-ease" position of the soldier. Deprived of its support, the left side of the pelvis then drops, and the strain of keeping the body erect is thrown upon the ilio-tibial band of *fascia lata*, the capsular ligaments of the hip joint, and the articular processes of the vertebrae, tissues which are unconscious of fatigue.

It is clear that with the dropping of the left side of the pelvis, the centre of gravity of the trunk is displaced to the left unless the upper part of the body be brought across the middle line. Thus, only the inclination of the lumbar spine towards the left

is explained; but if the pelvis be squared again, as happens when the girl is in the sitting posture, the upper part of the trunk would be inclined so much to the right that unstable equilibrium would be produced; the spine then has to be brought over again towards the left, and thus the dorsal curvature, convex to the right side, and the "growing out" of the right shoulder, are produced. The hip bone of that side is apparently "growing out" also. Sometimes, when this dorsal curve is high in the back, a third curvature, the convexity of which looks to the left, is to be detected.

The child who sits badly at school, on account, it may be, of faulty arrangement of form or desk, or on account of defective light or of imperfect lighting, is apt to throw the chief part of her weight upon the left ischial tuberosity, and then, with the left hand upon the table and the elbow hanging at the side, and with the right elbow resting upon the table, the right shoulder is kept constantly raised and the loin region of the column inclined towards the left. This is the way in which many a case of lateral curvature begins * and is perpetuated.

Alexander Shaw, to whose essay † on the subject of lateral curvature the author is indebted for much of the contents of this chapter, remarks that the affection may be looked for as about ten or fourteen years of age, and that its progress, which is at first rapid, becomes slower as the vertebrae consolidate; that at about seventeen it may be said to have arrived at its last stage. It is then neither disposed to advance nor capable of being arrested by treatment. In nine-tenths of the cases of lateral curvature the dorsal convexity is directed towards the right, because people are right-footed as well as right-handed.

* Two Lectures by Lichenich.

† Holmes's "System of Surgery."

With the lateral deviation of the column the weight is unevenly distributed upon the surfaces of the osseous and cartilaginous elements, so that that side of the body of the vertebra which is directed to the concavity, and the corresponding articular processes, undergo absorption. The body of the vertebra being squarred, as it were, from out of the region of excessive pressure, the tip of the spinous process is twisted into the concavity of the curve, the whole vertebra undergoing a rotation on its vertical axis. When, therefore, the line of the spinous processes is dotted out with ink upon the naked back, the track represents only approximately the extent of the curvature, the bodies of the vertebrae being much more deflected from their normal site than one would be led to infer. The vertebrae may be so much rotated that the transverse processes are directed backwards.

For **examining the patient** the clothes should be removed down to the level of the hips; she should then bend forward over a chair, and the line of the spinous processes should be traced out from occiput to sacrum. Being then partially redressed, the girl should be placed on her back on a firm couch, and the pelvis having been brought flat and square, it must be seen whether the legs are of the same length, for a slight inequality may cause a tilting of the pelvis and the deflection of the lumbar spine. Such inequality may be congenital, or the result of infantile paralysis. Lateral curvature may be left after hip joint disease; or after any other condition which prevents the patient evenly supporting the pelvis.

As a **result of lateral curvature** the chest and trunk may be greatly deformed; on the concave side the ribs will be crowded together, whilst on the other they are widely spread out; and from the rotation of the vertebrae, the angles of the ribs on the convex side will be pulled far back and rendered more acute, as

shown in the accompanying scheme. But great as the thoracic deformity may be, on account of the gradual and quiet manner in which it has been induced, the heart and lungs will have accommodated themselves to the situation without material inconvenience. Roth* remarks, that at the first examination it is essential to ascertain to what extent the spine can be restored to its normal position by a voluntary effort on the part of the patient, and a little help

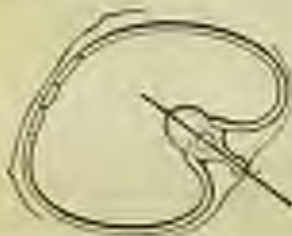


Fig. 40.—Section of Chest, showing
deformity consequent on lateral
curvature. (After Shaw.)



Fig. 41.—Section through
Trachea. (After Shaw.)

from the surgeon. The symmetry of the trunk may be improved by the holding up or out of one arm; whilst sometimes the best result can be obtained by raising both arms over the head. This exact position of the trunk and arms for effecting the greatest temporary improvement in the spine is the "key-note" of the exercises to be practised. By carefully planned exercises, regularly and efficiently carried out, the most favourable result is to be obtained.

It is, as already remarked, only in the early stages of lateral curvature that treatment can have a beneficial effect. Neither exercises nor supports of any sort can

* *British Medical Journal*, May 13 1892; *Transactions of the Clinical Society*, 1893.

undo the rotation of the spine, nor restore the original form to vertebrae which have been moulded by irregular pressure.

Treatment.—The spinal muscles should be so strengthened by exercise that the patient may be able to sustain the improved position without great fatigue. At first she may be able to maintain it only for a few seconds, but strength comes with exercise of the muscles. The thorax should be developed by systematic breathing, and by methodical exercises acting directly upon the ribs. Gymnastics, and exercises generally which do not bring on fatigue, are to be recommended. Boys are so rarely the subjects of lateral curvature, chiefly because in their games they use all their muscles, and do not sit cramped over music or needlework, nor, as a rule, too much over books, as girls are apt to do. Swinging by the hands from a horizontal bar, firmly fixed by staples and cord from the top of a doorway, is a good exercise. It gives the intercosteal fluid the chance of re-expansion, strengthens the scapular muscles, and probably helps in undoing some rotation of the vertebrae. After the exercises the patient should again place herself squarely in a reclining chair; she should not stand about.

Though the principle of treating lateral curvature in children by means of stays, jackets, and supports of all kinds, is generally disadvantageous, still it must be admitted that there are instances in which the adoption of mechanical support is necessary. Such are the cases in which the affection has been allowed to proceed untreated or unchecked; rotation and deformity are extreme, alterations in the shape of the vertebrae permanent, and the patient has not sufficient power of muscle to assume even a slightly improved position. Such unfortunate cases are absolutely incurable, though the comfort of the patient, and the powers of

breast-feeding and digestion, may be improved by the application of a poroplastic felt jacket whilst the patient is suspended. These cases can, however, rarely be met with in the surgery of childhood.

Parents are often anxious to have that same support is to be ordered; sometimes, indeed, they go to a shop and buy one for themselves, either without, or contrary to, the advice of the medical attendant. If the scoliotic child were not the victim of this craze for "spinal supports," one might almost say that the disappointment entailed was well merited. One must not let another one's opinions upon the important subject of the abuse of spinal supports. Not seldom these ingenious and complicated machines are ordered and paid for when their use is positively harmful. This, perhaps, one may assert, that sometimes those who prescribe seem to ignore the fact that the parents who have to pay for the apparatus may be little able to afford it. The primary cost is, to say nothing of secondary charges, absolutely astronomical. Having exhausted their means in the delusive hope of thus benefiting a feeble child, parents are compelled to apply for hospital relief; they bring the child with, but not wearing the cumbersome apparatus, which has been already found useless. The skin may have been chafed by its wear in mere places that one, and there may be extensive ulcers.

Too much responsibility is often thrown into the hands of the instrument maker; and sometimes the tradesman himself, and on his own responsibility, prescribes and fits an instrument. To him lateral curvature and angular deformity of the spine are often the same thing; at least, they need the same treatment, an expensive spinal support. Spinal supports of every kind are usually not only ineffectual in the treatment of lateral curvature, but absolutely prejudicial. They contain a weight of metal which exerts its

influence chiefly in tiring the child, and in helping to crumple up the pliable pelvic bones.

The child with lateral curvature should not be kept too much in the horizontal position, as this increases the inflexion of the spinal muscles. She must not be kept a prisoner to the house, nor must her chest be caged in felt or gypsum. She should be dressed in flannel, but not overweighted with clothes, and as the circulation is often feeble, the legs and arms should be well covered. None of the clothes should be tight, "Hygienic braces" and all apparatus of that sort, with which these children are sometimes supplied, should be discarded. A cold bath should not be allowed, except in the height of summer, but douchings with warm and cold water, and shampoos along the muscles of the spine, may be persistently carried out night and morning. Beyond all this, the lungs must be exercised, and the ribs and respiratory muscles brought into play by slow, deep inspirations by the nose, and expiration by the mouth. Both recommend that these respiratory exercises be repeated four times, whilst the patient is lying flat on her back, with the arms by the sides of the body, or extended above the head.

Another exercise is by fixing the patient prone, with the whole of the trunk, upwards from the level of the iliac crests, projecting beyond the end of the couch; the shoulders are allowed to sink towards the ground, and then, by calling into action the masses of the erector spinae, the shoulders are raised even to above the level of the rest of the body. This exercise may be gone through several times in the day; but at the beginning of the treatment it cannot be often repeated at a single occasion. Several firm longitudinal stockings of the patient's back by the assistant's two palms generally relieve any aching caused by the exercises. These stockings are also usefully employed

at home to relieve headache. After each exercise the patient rests a few minutes. Several of the simpler exercises have to be practised at home for about fifteen minutes twice daily.

When not walking about in the open air, or employed at gymnastic exercises, the patient should be sitting in a chair with a high, sloping back, and the occiput, as well as the scapulae, in contact with the back, in order that the sitting posture may be kept up without a relapse into the vicious position. She should be made to see the importance of, and interest herself in maintaining the correct posture when standing as well as when sitting, and in order that she may herself correct error and watch for improvement, she may practise before a good-sized looking-glass.

A serviceable and cheap reclining chair may be obtained at an outfitting or furnishing warehouse. It is the same chair with a sloping back, such as is often used on the deck of the large passenger ships.

The patient should go to bed early, and should not work at lessons or music before breakfast. The bed should have a firm mattress and a flat pillow. A very useful seat can be obtained by cutting a few inches off the hind legs of a common Windsor chair which has vertical rails up the back. If, after this, it appears instantly as the child thoroughly supports herself in it, it may be kept with its back standing against the wall. Barwell has suggested the use of a sloping seat; having found out the slope which gives best result, the legs of the chair might be seen in accordance with it. It is hardly necessary to say that no attempt at the forcible straightening out of a curved spine should ever be contemplated.

If the lateral curvature be secondary to a tilting of the pelvis from an inequality in the length of the limbs, the iliac crests should be brought to the same level, by increasing the thickness of the sole of the boot on the

affected side. Such elevation should be gradual, so that the spinal column may have time to arrange its elements in accordance with the changed conditions.

The meals should be plain, and taken at regular intervals. Calves and sweetstuff *do* the appetite; stimulants will not be needed. The laxative iron mixture, or that of cod-liver oil and iron, or the simple tincture of iron in water, may be prescribed. If continued supervision be given, even an amazingly curvature may be expected to cease to increase, so that later on, by an artful arrangement of corset and dress, the deformity is hardly to be detected even by the critical eye.

Curvature from rickets is evenly distributed from the neck to the loins, the head falling helplessly on to the chest, or down towards the child's knees. This condition has been dignified by the name **cyphosis** (esp^{er}, "bowed forwards"). There is no difficulty in recognising the bowing, as it co-exists with extreme rickets or general physical debility from other cause. The curvature is, at a glance, altogether different from that of curies, whilst the abnormal mobility of the spine gives evidence of the absence of inflammatory disease. If the child be put flat on the table, the spine comes as straight as ever.



FIG. 44.—Anterior
Posterior Curvature
Low Back Rickets.

Weak and growing girls are particularly apt to develop this hump-curvature, especially if they be the subjects of near-sightedness, so that they have constantly to lean forward to read, or even to see the food on the plate. Both shoulders are said to be "growing out," the explanation being that the shoulder-blades cannot lie flat upon the rounded back.

Treatment.—If the subject be an infant, careful feeding and clothing, and the administration of

cod-liver oil by the mouth or skin, and the maintenance of the horizontal position, will be needed. No support of any kind is required. If the child be a few years old he should take his meals as he lies on the floor, or if he be allowed to sit at table he should be made to lean back in his chair. Lolling over plate, picture book, or toy, should be prevented. For the growing girl, the treatment will be that prescribed upon page 361; and care must be taken that if the eyes be weak she be supplied with glasses, which have been selected by one skilled in ophthalmic surgery, and not merely picked out by the tradesman, whose business should be to sell rather than to select. At lessons she must be made to sit as directed in a previous part of this chapter. She should not, for a time at least, be allowed to continue reading lessons.

Neuro-mimetic (hysterical) affections of the spine are met with in growing girls; occasionally nearly all the signs of vertebral caries are detailed whilst the skin is found marvellously hyperæsthetic. Fortunately, (page 161) these nervous symptoms are generally so exaggerated that the nature of the disease is promptly detected. The pain and tenderness are generally in the *obla*, the child complaining when, if her attention be directed to the part, the skin is gently pinched; stiffness of the spine is conspicuous by its absence.

Treatment.—Such a child will require change of air and scene, and possibly some studious habit should be given up, and more exercise in the open air insisted upon. A course of iron and quinine, early hours, and social and domestic quiet, will be advisable.

CHAPTER XXVI.

PERIOSTEUM AND BONE.

THE diagnosis of **acute periostitis** is often obscure for a time, and the disease is thus allowed to make considerable headway before its exact nature is recognised. That for which it is most often taken is acute rheumatism. The attack comes on with great suddenness. The anxious mother puts the child to bed, wraps the limb in flannel or surrounds it with fomentations, and tells the doctor that the child has "rheumatism." Her mistake is as natural as it is pardonable. The doctor having heard of the suddenness of the attack, and finding the limb hot and painful, and the skin perhaps already congested and tender; and discovering probably that the child's temperature is several degrees above 100° Fahr., accepts the diagnosis thus suggested to him, and prescribes a course of salicylic acid, or of some potash salt. But as, after several full doses, the temperature does not descend nor the distress diminish, suspicions are aroused, and on the practitioner examining the limb he finds great thickening about the diaphysis of the bone, whilst the epiphyses and the articular surfaces are unaffected. Had the case been one of acute articular rheumatism, the swelling would have been at the joint, and not in the shaft of the bone.

The history of the beginning of many of these cases is just that of acute rheumatism. Thus, a boy has been going about in wet or muggy weather, and his boots and trousers have been constantly damp; or a child gets soaked through on her way to school, and sits in her wet clothes, and so on. In another

unhealthy ill-dressed child, the cold east wind may be accountable for the attack.

The **symptoms** of acute periostitis are heat, swelling, tension, and discoloration; first the skin is reddish, and then of almost a red-brown colour. If the bone be deeply placed (*femur and humerus*), discoloration of the skin may be late in appearing, whilst over the skin it comes on quickly. By gently grasping the bone between the finger and thumb, and making a comparison with the other side, a deep-seated swelling is made out; the tenderness is excessive. Edema of the limb steadily increases, and the neighbouring joints may become swollen and painful. The fever is high, and shiverings, or even convulsions, may occur; exhaustion and sleeplessness are great; appetite is gone, and thirst is extreme.

Case 1.—A girl was admitted to St. Mary's Hospital, April 12th, 1883. She had been treated for acute rheumatism of hip joint. Both parents were rheumatic. The face was flushed, temperature $103^{\circ} 5'$; delirium at night. The top of the thigh was swollen and fixed. Salicylic acid and leeches had had no permanent effect; there was central thickening and tenderness at upper end of thigh. There were signs of septicaemia. Exploration, after Hilton's method (page 255), procured evacuation of subperiosteal abscess. The hip joint was unimplicated. Convalescence was retarded by the occurrence of pyæmic abscesses.

Case 2.—A boy of six went to bed quite well, and next morning could not put his right foot to the ground: the leg swelled rapidly, and was supposed to be the seat of acute rheumatism. On the Sunday following (two days later) he vomited, and was hot, thirsty, and very ill. The leg was red, shining, and tender. Under chloroform an incision was made down the front of the tibia, thick pus oozing; the

entire diaphysis was stripped bare by subperiosteal suppuration; a bent probe could be passed around the diaphysis. Counter-openings were made in upper part of leg, and by the internal malleolus. The bone was quite white, like ivory, but as it was firmly connected with its epiphyses it was given the chance of becoming again clothed with periosteum. The cavity was washed with iodine water, and the limb surrounded with salicylic wool, subjected to gentle compression, and raised upon a pillow.

Next day the temperature was 99.8° , pulse 134° ; the wound gaped and discharged freely. Within a week the bone looked pink in places, the granulations being firm; the periosteum was becoming again adherent, the discharge was slight, and the temperature almost normal. Recovery was eventually completed without loss of bone and without periosteal thickening.

In another case abscesses formed along each shin bone. The patient was a wretched boy, who earned his living by chalk-drawings upon the pavement. On one side pus had found its way into the knee joint. On the other, suppuration was more limited, though on making an incision into the swelling, a considerable portion of the tibia was found bare. Pyæmic abscesses occurred in various parts. Amputation of the thigh on the side of the secondary arthritis was performed and recovery slowly advanced.

Pathology.—The inflammatory changes probably begin in the deeper layer of the periosteum, the subjacent bone being unimplicated. Possibly they are started by the deposit in the weakened periosteum of certain germs from the infected blood; the rapidity with which pyæmia and other septic complications supervene support this theory. Effusion takes place rapidly, so that by the increasing collection of pus, serum, and blood the periosteum is literally stripped from the length and circumference of the diaphysis.

It is unusual for the inflammation to extend into the articulation, because the epiphyseal cartilage acts as a barrier between the circulation of the shaft and that of the epiphyses, yet the inflammation may advance along the fibres of the capsule. In the case of inflammation of the upper part of the shaft of the femur, however, the hip joint is likely to be implicated, because the diaphysis extends within the capsule; but in the record on page 356, though the periostitis was acute, it did not implicate the joint. However, sometimes the layer of epiphyseal cartilage at either end of the shaft is destroyed, and the diaphysis lies loose in an extensive subperiosteal abscess.

For a long while the tough layer of the periosteum prevents the escape of the pus towards the surface of the limb, and during an unfortunate delay, the slender vessels which are passing into the compact tissue are stretched and torn, and the risk of acute necrosis is rendered extreme. The disease is then sometimes called acute necrosis,* a term which suggests as a separate pathological entity what is but the effect of disease. If a young practitioner become impressed with the existence of such a fierce disease as "acute necrosis," he may rashly conclude that bare bone discovered in a subperiosteal abscess is in need of immediate resection.

Clinton Dent† remarks that among French surgeons the opinion is very generally held that total necrosis of the shaft will not take place from acute periostitis without the co-existence of osteomyelitis. One might maintain, however, that complete necrosis of the diaphysis may follow on acute periostitis which has been allowed to run its course, without the intervention of osteomyelitis. But inflammation of the bone is so often associated with that of its covering, that it may be impossible to draw a line of demarcation

* Keen's "Surgery," vol. II., p. 273. 2d ed.

† Boston Chirurgical Transactions, vol. 14.

between them, at least in practice. Towards the seventh or tenth day of the disease, sometimes earlier, fluctuation may be detected; diarrhoea and delirium may come on, and the child may sink from exhaustion, pneumonia, pleurisy, or metastatic suppuration.

On abscess bursting through the periosteum, pus will be extravasated amongst the muscles, so that in deep-seated abscess occurring in children the finger should be passed down through the opening made for the escape of the pus, to see if the trouble have not started from the periosteum or bone (*Macnabara*).

Treatment.—When the child is anaesthetised, examination may be begun, and a free incision should be made down to the bone, the limb having been first washed with an antiseptic solution. *Ramarch's* bandage should not be used, lest further extravasation of pus occur. If the shaft be tried and be found firmly connected to the epiphyses at both ends, every chance should be afforded it of reclothing itself with periosteum; but if it become detached at either junction cartilage, it should be lifted out. If it be decided to leave the diaphysis, a clean probe should be passed along the space beneath the periosteum, and the most dependent part selected for the introduction of a drainage tube. Warm solution of boracic acid, carbolic acid (1 in 40), or corrosive sublimate (1 in 1000), should be freely used with a large glass syringe or an irrigator. The drainage openings must be made low down; it is unsatisfactory to have to squeeze fluids upwards on the occasion of each dressing. The dressings may consist of iodoform or salicylic wool, or of wood-wool or carbolised tow in gauze bags. The limb should be gently compressed by a soft roller and elevated.

Opiate, quinine, and iron, will be required; and wine, eggs, milk, and fresh meat will be important elements in the diet.

On the following day the dressing should be renewed, and for this occasion at least, chloroform may be again administered; the drainage tubes may be changed for others of smaller calibre. The subsequent dressings will be performed as occasion may direct, but the wounds must be kept sweet, if necessary by frequent irrigation with warm antiseptic solutions.

If, in spite of watchful care, the child do not improve; if the temperature keep high, and the pulse become small and quick; if the appetite fail and the child grow pale and exhausted, either the diaphysis must be resected or the limb amputated.

It is quite likely that the child will be in a pyæmic condition before heroic treatment have been attempted, or even before the existence of abscess has been recognised; there may be convulsions, profuse perspirations, and sickness. Amputation would then be required; so also if an adjoining articulation be invaded. Convalescence, except after amputation, is sure to be prolonged, and it is likely to be still farther retarded by the occurrence of metastatic abscesses.

Attention must be specially directed to the fact that the entire diaphysis may be stripped bare by subperiosteal suppuration, without necrosis necessarily following; free escape having been provided for the matter, and the child being strong, the periosteum may gradually adhere once more to the bone. Thus, it would seem that the diaphysis obtains a servicable supply of blood through the active vessels of the epiphyseal cartilages.

Billroth advises* the repeated painting the limb with a strong tincture of iodine; vesication is thus produced. He has found this treatment so satisfactory that he no longer employs cuppings or leeches in the treatment. "Determination to the intestinal canal by means of saline purgatives should not be

* "Surgical Pathology," vol. I., p. 336.

cure in this and all other acute inflammatory diseases." Most surgeons would rely upon the influence of leeches and of early incision. Evaporating lotions and ice are inefficient remedies.

Hillroth even suggests that incisions be not made until fluctuation is distinct and the skin thinned. He is opposed to the practice of cutting down to the bone through a stiff-walled abscess. I would, however, with all deference, advise that incision be made down to the bone as soon as the nature of the disease is suspected. In these desperate cases the sooner that tension and engorgement are relieved the less the risk of necrosis.

Acute periostitis does not necessarily end in supuration; under appropriate treatment in a healthy child, resolution may occur, and the effects of the disturbance quickly pass off. Occasionally the attack degenerates into a chronic periostitis and osteitis, but the milder form of the inflammation is usually chronic from the beginning; the conditions of acute and chronic inflammation being clinically distinct.

Acute periostitis may be associated with **inflammation of bone and medulla**; *osteomyelitis*. It may be impossible to differentiate this from acute periostitis. In each case there are the urgent symptoms. The limb is swollen, the skin tense and shiny, perhaps red, the limb lies at rest, and the least movement causes pain. There is the deep-seated swelling of the shaft. Acute inflammation of the bone often runs hand in hand with that of the periosteum.

Treatment.—In the early days, or rather hours, of the disease (for the course is very rapid), leeches may be applied and the limb surrounded by flannels wrung out in warm water, and applied under oil-silk. The limb is comfortably secured on a splint, and raised on a pillow. Morphine may be administered. Several incisions may be made down into the inflamed bone.

Under active treatment recovery may take place, but it is probable that amputation will be eventually demanded as high above the infamed bone as practicable. The complications may be acute necrosis, pyæmia, and septic pneumonia.

Sir Joseph Fayrer and Macnamara* are strong in urging amputation and reamputation; and the less the delay in resorting to the operation the better. "After rigors (convulsions), and other symptoms indicating pyæmia have commenced, by far the best prospect is to remove the whole of the affected bone."

Central necrosis in the shaft of a bone may be the cause of persistent enlargement and pain; the appearances may be very much like those of chronic osteomyelitis, especially if the acute inflammation of the bone which determined the necrosis have been followed by deep thickening. Free incision down to the shaft may reveal the exact nature of affairs, and may prevent recourse to the grave measure of amputation. Possibly a sequestrum may be removed, or an abscess opened by the operation.

Chronic periostitis may be the result of wet, cold, or injury. It is most often met with in the strumous subject, and is generally associated with osteitis. The bones most frequently affected are the tibia, femur, and the metacarpal bones. A boy has recently been under treatment, who, some months previously, had knocked his leg whilst at play. He was made to lie up at home for a day or two, but, as he admitted, he was running about before the surgeons had disappeared. There was thickening over the front of the tibia, and the spot was evidently tender. As always happens when a fibrous tissue is inflamed, the pain was worse at night, and when the days were wet and cold; as also after exercise.

The treatment consisted in the application of a

* "Diseases of Bone," p. 22.

low boots; in enclosing the limb in a plaster of Paris splinting; and in aiding venous return by raising the limb on a pillow. Iodide of potassium and iron, and later on, cod-liver oil, were proscribed. Treatment, carried out with thoroughness, gave a satisfactory response.

Another strumous subject had chronic disease of the shaft of the metacarpal bone of the thumb; his brother was in hospital for hip joint disease. The treatment was much that sketched out in the chapter on struma, absolute rest being secured for the affected bone. (The subject of *dactylitis* is treated of in chapter iv.)

Chronic osteo-mylitis may be a primary affection, or it may be secondary to disease of an articulation, an abscessation wound, or other injury to the bone. The femur and tibia are most likely to be affected. The symptoms are deep-seated thickening in the limb, with general enlargement of the bone; pain, tenderness, and constitutional disturbance.

Treatment.—The limb should be secured upon a splint and raised. Tonic and anodynes will be required. If the child be losing strength, and the local trouble do not improve, exploration should be made under chloroform if no further surgical procedure appear demanded; the wound may be drained and compression of the limb resorted to. Liberal washings and dressings of corrosive sublimate, or other antiseptic, will be necessary.

But if after this the case give no promise of improvement, either amputation will be needed or the scraping out of the mass. This operation is described by Keetley.* Supposing that the femur be involved, a free incision is made along the outer side of the thigh, after the application of an Eschsch's bandage. The bone is opened up, and, if necessary,

* "Annals of Surgery," No. 1.

troughed, and the medullary cavity is scraped out from one epiphysal cartilage to the other. The cavity is syringed out with a solution of corrosive sublimate (1 in 1000), and then with a concentrated ethereal solution of iodoform; drainage tubes are introduced, and wool-wool dressing applied. He speaks with confidence of the result of the proceeding, remarking that it is followed by little or no constitutional reaction or danger to the life of the bone; he believes that the operation may often be the means of rendering disarticulation of the limb superfluous.

Epiphysitis expresses primary inflammation of the cartilage between the shaft of a bone and its extremity. The neighbouring periosteum would be secondarily affected. Though the disease may occur at any period before ossification is complete, it is usually met with in children of not more than three years of age (Macnassar). The inflammation is apt to be mistaken for disease of the neighbouring joint. It runs an acute course, destroying the joint or ending fatal septicaemia. In certain cases of infantile arthritis the trouble has begun in the epiphysal cartilage.

When a junction cartilage has melted away, the appearances presented may closely resemble those of dislocation, or of a fracture near a joint. But dislocation is rare in childhood, and the history of fracture is not like that of detached epiphysis; the latter is a much more serious trouble. (For syphilitic disease of epiphysis, see page 70.)

Treatment.—Epiphysitis may be combated by the application of leeches and the internal administration of minute doses of *hæmorrhum*. Incision may be made upon the inflamed tissue, drainage being provided for.

Acute arthritis of infants* is the name given by Mr. Thomas Smith to a disease which occurs within

* See Dr. Bartholomew's Hospital Reports, 1862.

the first year of life. The inflammation comes on suddenly and may quickly destroy the joint or the life itself. It rarely produces ankylosis, but leaves the child with a short, fat-like limb. The disease may depend neither on injury nor syphilis; the suppuration may begin in the articular end of the bone or in the joint.

Symptoms.—The joint is stiffly flexed, swollen, and painful, but perhaps it is not until pus is reaching the surface that the skin becomes reddened. After the evacuation, recovery may ensue with strange rapidity, but the child may sink exhausted by discharge, or be carried off by pyæmia.

In some of Smith's cases, examination after death showed the joint end of the bone partially absorbed or hollowed by abscess. (It may be only by sawing the bone longitudinally that abscess beneath the articular cartilage is discovered at the autopsy.)

Treatment.—Leeches will afford but temporary relief, and the use of opium and fomentations may merely mask the symptoms. When the joint is swollen, stiff, and painful, the tension should be at once relieved by puncture of the capsule by a hydrocele canula, or by a skeletal tenotomy knife. The instrument should not be introduced in the neighbourhood of any main trunk of artery, and the most accessible part of the articulation should be sought.

Case.—An infant of eight months was brought for a swollen and tender shoulder; attempt to move the arm caused the scapula to move with it; the trouble had come on directly after the infant had been swung by the arm. Palliative treatment availed nothing, but the local and constitutional trouble grew worse. A tenotomy knife was passed through the deltoid (the infant being unæsthetised), and joint abscess evacuated. Iodine washings and drainage were employed, and on the twelfth day the wound was allowed

to close. The infant made a complete recovery, and the humerus now plays in the glenoid cavity as freely as does the other. Had one waited for redness, or for distinct fluctuation before operating, the joint would in all probability have been sacrificed.

Subperiosteal and central tumours of bone are fully treated of in Butlin's work on *arrows and encrustations*.

A malignant tumour, which takes its origin from bone, must necessarily be upon the type of fibrous tissue, a sarcoma (page 112), for there is no epithelial element from which it could spring, even the endothelium of the blood vessels belonging to the connective tissue series. It may be impossible to determine whether a sarcoma be starting in the substance of the bone or from the deep layer of the periosteum. The bones most often the seat of sarcoma are the lower jaw (page 114) and femur.

Diagnosis.—Though sarcoma grows more quickly than an innocent tumour, and is often attended with pain, it is sometimes difficult to differentiate between it and a chronic osteitis and periostitis. A large sequestrum, surrounded by an extensive formation of new bone, gives much resemblance to a sarcoma; the latter, however, is more likely to occupy the articular end, whilst necrosis attacks the diaphysis. The introduction of a grooved needle would show the sarcoma to be soft and succulent, whilst the inflammatory disease would be hard or yield *peu*. "If, in spite of perfect rest, an affected limb continue to increase in size, the argument is strongly in favour of sarcoma." Exploratory puncture might be needed to differentiate chronic abscess.

In case of doubt, glandular enlargement should not be waited for, but exploratory incision undertaken. No time should be lost; high aspiration may offer the only chance of success. But even then, as Butlin

remarks, only a slender hope can be held out of ultimate recovery; for though the child do not die from the immediate shock or other effect of the operation, he may succumb to secondary affection in the lungs. Amputation at the hip for malignant disease of the femur in childhood is not desperate if done early. It should be performed after the manner of Pott and Jordon (page 422).

CHAPTER XXVII.

FRACTURES.

In the rickety child the bones, though containing an excessive proportion of animal matter, are brittle. This may be due to the fact that the conversion into the solid bone is accomplished by a process of petrification rather than of ossification.

The bones most often broken are the femur and clavicle. A slight amount of violence often suffices for the fracture.

From the continuous crying or fretfulness, the mother suspects that there is something wrong. Then, when the part is disturbed, during the washing or dressing, there are evident manifestations of pain. Sometimes the nature of the injury is not recognised for a day or two. Often, no history of the child having met with injury is to be obtained.

The **diagnosis** may rest upon merely circumstantial evidence; thus, the child was well in the morning, later on he is found crying, and unable to move the swollen limb. This is almost enough; the suddenness of the occurrence, the existence of an encircling swelling, and the evidence of tenderness. The swelling is due to effusion about the seat of

fracture; but if the periosteum and muscular attachments be not torn through, there will be no displacement. The periosteum is thick and tough, and steadies the fractured surfaces. The swelling at the seat of fracture will be found deeply placed, and extending all around the bone.

On fixing the limb above the tender swelling, and grasping the elbow or knee with the other hand, and gently moving it from side to side, a characteristic yielding is noticed at the fracture. To enquire for crepitus in such circumstances is unnecessary; it may damage the periosteum, or possibly may convert a partial into a complete fracture. In children, fracture is apt to be situated at the line of an epiphyseal cartilage, in which circumstances crepitus might not be definitely obtainable except by the rudest violence.

Chloroform will hardly be required for diagnosis, unless the fracture be near a joint. But if, after careful examination, the surgeon be unable definitely to pronounce the existence of fracture, the limb should certainly be dealt with, at any rate for the time, as if that lesion existed.

INCOMPLETE FRACTURE.

The greater the proportion of animal matter in the growing bone, the greater is the liability for the bone to be bent without its tissue being entirely broken through. There are two varieties of this incomplete fracture. The bone may be broken half way through, whilst the other part is only bent.

Secondly, the bone may be bent without any breakage having occurred. The term "greenstick fracture," which is applied to this second kind of injury, is a misnomer. Frequently several bones are broken at the same time, for the condition which makes one of them fragile equally affects the others.

The *clavicle* of the rickety child is very liable to greenstick bending. The long bones of the fetus may be broken *in utero*, from the effect of injuries received by the mother. During parturition, also, fractures may take place, either from the forcible expulsive efforts, or under the influence of assistance rendered by the bedside attendant. A case is on record in which, from officious help at birth, the lower epiphysis was separated from the shaft of the femur, and the upper one from the tibia. These injuries may occur even in the case of the well-developed and healthy fœtus.

The **treatment** of incomplete fracture may involve the forcible effacement of any angular deformity. The straightening should be accomplished under an anæsthetic, and during its performance it is quite possible that the unbroken fibres of the bone may be felt to be yielding, and a definite crepitus may declare itself. The limb is then put up in moulded splints, the skin having first been protected by soft bandage or an even padding of wool. The constitutional condition must be attended to (page 63). Lime-water may be advantageously mixed with the milk, and especially so in hot weather. These cases generally do well, the bone becoming quickly consolidated, whilst the improved hygiene to which the child is subjected produces a marked benefit. The less that the part is disturbed the better, and it will be advisable to preserve it long at rest, lest the milking medium be found of insufficient stability, and angular deformity supervene. If either without, or in spite of, surgical treatment such deformity be found in extreme degree on the cessation of union, it will be better to administer an anæsthetic. If necessary, the bone may be straightened over the knee, but the existence of epiphyseal cartilages must be remembered. But if the deformity be not very marked or unsightly, it will

be better, ensuring rest, to leave it to nature. It is surprising to find how, with the growth of the bone, and with the absorption of the reticulated cement, the angularity steadily diminishes. Re-fracture should be undertaken only after the conclusion has been deliberately arrived at that the case is beyond the range of adequate improvement if left uninterfered with.

SPECIAL FRACTURES.

The **clavicle** of a weakly or rickety child may be broken by a small amount of violence. The child cries and does not move the arm; quickly a swelling appears at the spot. To diminish to the utmost the pressure on sensory nerves, the child holds his head down to the damaged side, and, dragging up his shoulder, it becomes a difficult matter for the surgeon thoroughly to inspect the part. Probably the periosteum will not be torn through. Occasionally both clavicles are found bent or broken.

There will be no "dropping of the shoulder" as in the adult, and no search is to be made for crepitus. It suffices that the child has met with an accident, and that he now does not move his arm, that a tender swelling has suddenly appeared about the middle of the clavicle, and that the head and shoulder are approximated. By tracing the finger along the tender part an elevation in the course of the bone may be made out.

The acromial end may be broken, but usually the fracture is at about the middle of the bone.

The **treatment** demands rest for the bone, by fixing the arm to the side with a few turns of a soft, wide roller, and it is better to imprison the hand as well. The turns of the roller may be kept in place by a few stitches, and a close-fitting-cinglet may be drawn over all. A thin layer of linen may be laid between the naked arm and chest, and violet powder

may be dated. An axillary pad will not be required; the arm is simply to be extended against the chest for the space of three or four weeks.

Soap plaster is not well adapted for securing the limb; it becomes loosened by the warmth of the body, and is then thrown into cord-like bands. It is, moreover, apt to cause eczematous eruption.

The **humerus** is not so frequently broken in its shaft as is the femur. The hand and fore-arm and arm having been smoothly bandaged in a soft roller, mill-board splints softened in hot water, or any plastic material properly prepared, must be evenly adjusted around the limb from the axilla above to the elbow below. The elbow may be then bent and the entire limb fixed against the side of the chest. Nothing is gained by letting a restless child have his hand free. A cruet may be used for keeping the bandage from disturbance.

The sooner that the broken arm is subjected to the even compression the better; it is a mistake to delay the active treatment of any fracture until the swelling has begun to subside. The compression will prevent the disappearance of the swelling, or prevent its appearance.

If persistent complaint of dissonant be made during the progress of the cure, the part must be exposed and thoroughly inspected. Children do not complain without cause; perhaps a piece of hardened splint is pressing unevenly, or one turn of the roller has become tightened, or an abscess is forming about the bone. At all events the limb must be examined and secured again. Sometimes it gives comfort gently to rub the bared limb in the direction of the venous return before re-applying the bandage, but the mere re-adjustment may restore comfort. The limb should be kept at rest for four weeks, and then gradually restored to freedom.

Non-union of fractured surfaces is of extreme rarity in childhood; but the unresorbent is apt to yield to weight, especially in weakly children.

A word of caution must be given against applying bandages tightly or unevenly; erysipelas or gangrene may follow such constriction. The softer and more elastic the material of which the roller is made the better; dometto is preferable to cotton.



FIG. 11.—Humerus, Head, Epiphysis and Lower Condyle detached.

Fracture may take place through the upper epiphysal cartilage. The plane of the fracture may deviate slightly from the plane of the cartilage, in places passing through young and fragile bone tissue. With so extensive and rough a fractured surface it is hardly likely that there would be the complete displacement, nor is it certain that one would be able to obtain a definite crepitus, for on rotating the arm the head fragment would rotate with the shaft.

The line of the epiphysal cartilage does not pass in a horizontal plane, but is arranged in such a way that the head of the bone receives the conical end of the diaphysis into a sort of socket.

To enquire too closely for crepitus is to cause undue pain and needless local disturbance, but it will be advisable to put the child under the influence of an anæsthetic and thoroughly but gently to examine the swollen shoulder. There must always be decreased freedom of movement when a bone is broken near a joint: in the case of this fracture the shaft of the bone may be moved without disturbing the joint end.

Treatment.—Whether the diagnosis be clearly

made out of, or on, a small flat pad of cotton-wool, folded in a soft handkerchief, may be placed in the arm-pit, and the arm and hand fixed against the side of the chest, as in the case of fracture of the clavicle.

Case.—In the case of a girl of eight, who has been recently under treatment, the fracture occurred from the nurse twisting the child's arm behind her back, but with no great violence. Thus the humerus was converted into a lever of the first order, the fulcrum being found at the spot where the bone was brought into firm contact with the chest wall. On examining the joint under chloroform, crepitus, of a peculiar "mortary" feel, was easily obtained. The end of the diaphysis projected somewhat outwards, and could be easily felt through the thin deltoid. Swelling came on quickly. It is well to mould a pop-plastic or mill-board splint over the deltoid region for the sake of the compression. It is hardly necessary to remark that no inside splint can be of service, the fracture being high up in arm-pit. The chest affords an excellent support for the shaft fragment. The fore-arm and hand should be worn in a sling.

Union of an epiphysis is, as a rule, quickly effected, so that the parts should not be fixed for more than three or four weeks; they should then be allowed complete freedom. If the arm be kept longer in the bandages the stiffness is slower in working off. Exercises and massage expedite the usefulness of the limb.

The elbow and fore-arm must not be raised, lest the upper end of the shaft fragment do not remain in approved opposition, and so, after the removal of the bandages, some unnecessary perils at the line of fracture. Even after the exercise of much skill and attention some irregularity may be detected on the removal of the splint. This should cause neither alarm nor anxiety; it will probably be smoothed off with the subsequent growth of the bone, and when

the deltoid has been fully exercised again, any little shapelessness will be obscured under the thickening bundles of muscular tissue.

General caution.—In every case of fracture near a joint or through an epiphysis, it is desirable that the surgeon, however skilled and competent he may be, do not take the undivided responsibility of the case. Some untoward event is apt to be associated with the injury which no exercise of art can with certainty avert. Thus, suppuration may occur, and death follow from pyæmia; or synostosis or other form of permanent stiffness may result; or there may be some deformity; the humerus may fail to be properly developed, and the limb may be less useful than was anticipated.

Over the result of the treatment of injuries near a joint, skillful as it may have been, great unpleasantness is apt to ensue. So that the parents should be made at once to thoroughly understand the serious nature of the injury, at least as regards the future effect; they should not be caused needless alarm, but should see the advisability of adopting precautions. A shoulder or elbow left permanently stiff may well enough ruin a professional reputation; its existence is never forgotten. In every country village some brother practitioner can and should be found to help with anæsthetic and counsel.

If, when all swelling has subsided, union be taking place with some deformity, the surgeon should think twice before breaking it down with the idea of re-setting the bone. Such interference might result in fracture of the bone in a fresh place, or might be followed by serious local disturbance.

Fracture through the lower epiphysis is apt to be mistaken for dislocation at the elbow joint. The epiphyseal cartilage passes horizontally just above the condyles, the trochæa, and the capitellum. These

portions of the humerus have separate centres of ossification and (with the exception of the internal condyle) coalesce to form an epiphysis which is united to the shaft in the sixteenth or seventeenth year. (The internal condyle joins with the shaft in the eighteenth year.)

The plane of the fracture may wander slightly into the adjoining bone tissue. The injury is most

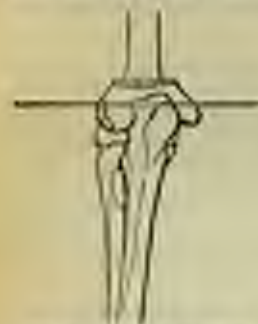


Fig. 64.—Fracture through Lower Epiphyseal Cartilage.



Fig. 65.—Dislocation of Radius and Ulna backwards.

likely caused by a fall upon the elbow, a wheel passing over it, or by a fall upon the outstretched hand.

The **diagnosis** is generally easy, but if the signs be indefinite, an anæsthetic should be administered and a deliberate examination made. It may be noticed that the front of the forearm is shortened, and that there is a projection behind the lower end of the humerus. On grasping the limb above and below the joint a strange lateral movement is detected. The joint fragment, if previously displaced, can be easily restored, though it is apt to slip back again. The movements of pronation and supination are permitted;

the top of the olecranon process is still in the normal horizontal line with the condyles of the humerus. Now is the dislocation, as shown in Fig. 65, the top of the olecranon process is raised high above the normal line, the line of the condyles of the humerus. The fracture is not necessarily accompanied with displacement. The nature of such an injury is not likely to be overlooked if the rule be followed of grasping the shaft with one hand and the condyles



Fig. 65.—Peppercorn for Elbow Splint.



Fig. 67.—Elbow Splint applied. (After Lonsdale.)

with the other, and searching for the characteristic lateral movement.

Treatment.—The hand and fore-arm should be evenly bandaged, and a layer of cotton wool should be secured around the flexed elbow joint, the bandage being subsequently continued up the arm. A plastic splint having been already cut to the paper pattern, and prepared, should be moulded on to the elbow, the joint being arranged at a right angle, and being studied as the mould hardens. It matters not of what material the splint be composed so long as the surgeon be handy at its application: flannel soaked in creamy plaster of Paris, Hodge's or Cocking's splinting, willow-bark, dressed leather, gutta-percha, any one of them will do, but it must be applied with evenness and firmness. It should be long enough to reach well up the arm and down the fore-arm. The adjoining

figures show the material reached ready for softening and application, and the splint moulded on to the elbow. The arm had better be secured inside the dress for three weeks. (On account of its great hardness, a gypsum bandage must be used with caution.)

The thickening and stiffness will subside in time, and it will not be advisable to attempt to expedite matters by forcible manipulation or flexion. Parents should be made to understand that the joint must be stiff for some time subsequently, and that in rare instances the joint remains permanently affected; while fracture at that particular spot is a serious injury. Should deformity with ankylosis follow, excision of the joint might be deemed expedient.

Sometimes the separation of the epiphysis is complicated with a vertical fracture into the elbow joint, in which case, in addition to the signs already given, it will be found that on catching the condyles firmly



Fig. 66.—Fracture through Lower Epiphysal Cartilage of Humerus, extending into Elbow Joint. "T" fracture.

between the fingers and thumb they are not in solid connection with each other or with the shaft. The treatment will not differ from that advised in the previous case, but it must be explained from the first that some deformity and stiffness may probably remain even permanently. It is also possible that the injury may be followed by a partial arrest of development in the lower end of the humerus. Indeed, in every case of fracture through an epiphysal cartilage, subsequent shortening of the limb may be involved.

Fracture may extend obliquely into the joint through the epiphysis, without there being a detachment of the epiphysis. This is made out by the fact that one condyle is loosened, though not detached, and that a certain amount of lateral movement is obtainable at the elbow joint. Crepitus may be detected on flexing and extending the joint, or on rotating the radius. The treatment will be that just described.

One of the condyles may be broken off without the joint being implicated, or the lower epiphysis being otherwise hurt. The inner condyle is the more likely to be found detached, on account of its being more exposed to injury in a fall upon the elbow; it does not join the shaft of the humerus until the eighteenth year. To secure a long union of the inner internal condyle, the elbow should be kept fixed for a few weeks in a moulded splint. Sometimes it becomes attached to the humerus by ligamentous tissue only, but, fortunately, this faulty union entails no serious inconvenience.

After a limb has been confined in absolute rest for two weeks, or a little more, it may be advisable to take it down for a few minutes in order, with the utmost care and gentleness, that each joint may be judiciously exercised. In this measure there should be no disturbance of the seat of the fracture, and immediately afterwards the limb should be restored to security. If the movements give pain they should not be persisted in; in this case there would probably be some inflammatory trouble still lurking about the joint.

At the end of two weeks the swelling would probably have subsided, and the surgeon could reassure himself of the parts being in perfect apposition. If by chance there had been any misconception of the nature of the original lesion, the matter could at this early date be easily rectified.

The stiffness following injury to a joint should never be dealt with by spasmodic force, for the violence necessary to break down adhesions might cause disjunction of a neighbouring epiphysis. In any case it is apt to set up a serious arthritis. With fracture near the extremity of a long bone, the joint is sure to suffer temporarily from adhesive synovitis. Roughly to move the joint might be to wreck it completely. Stiffness in childhood almost certainly works off in time, unless fracture seriously implicates the joint. On the subject of stiff joints in childhood, Sir James Paget writes,* that happily "bone-setters" are allowed to have but little practice among children. Happily, for children's joints are much more imperilled by violence than those of older patients.

Fracture of the **radius** and **ulna** may be incomplete. The bones may require straightening before the splint is applied. The limb should be evenly bandaged from the hand upwards, and enclosed in plastic splinting. Wooden splints are inconvenient for children; they are apt to press unevenly, and to slip out of position. If used they should be secured with wide bands of soap plaster. For about three weeks the apparatus should be worn, and for the first few days it will be convenient to keep the child in bed, with the arm raised upon a pillow. Traumatic effusion is much better treated by even compression than by lotions.

The **radius**.—Fracture may take place through the lower epiphyseal cartilage, from a fall upon the outstretched hand; the symptoms will be similar to those met with in a Colles's fracture, but, from the squared direction of the separation, malposition of the fragment is unlikely to occur. The head of the ulna is rarely detached.

Treatment.—A plastic splint should be moulded

* "Clinical Lectures and Essays," p. 93. 2nd edition.

on the forearm, wrist, and palm, and kept there for about eighteen or twenty days. Such an injury might interfere with the due growth of the bones of the fore-arm.

Metacarpus.—The first metacarpal bone is developed like a phalanx, the epiphysis being at its proximal end. A blow from a stick or a cricket-ball might detach the epiphysis. Fracture through the epiphysal cartilage of the first metacarpal bone might be mistaken for a dislocation. The treatment for each injury is the same. A splint should be moulded, and the hand should be worn in a sling.

The **os innominatum** may be broken by great violence, but a smaller amount of force acting at one spot may suffice to detach a piece of the crest, which, up to puberty, is cartilaginous. A kick may break off the anterior, superior, or inferior iliac spine. Under the influence of rest in bed, the epiphysis quickly joins. The knees may be tied together and bent over a pillow, no pelvic band being required. In the case of a boy being knocked down with violence, an examination should be made of the iliac crest, even if there be no bruising of the skin to direct attention to that part.

The first step in the examination of an injured child is to have it completely stripped of clothing and laid on a firm, flat surface, such as a table on which a blanket has been folded. This should be without unnecessary exposure to draughts or cold.

Inspection is made for bruises or swellings, or for noticeable lumps. Then each limb is examined with the fingers; any apparently tender part especially attracting attention. Each joint is cautiously exercised, and, so far as practicable, the integrity of each epiphysal cartilage tested. The child should be turned over, and the spinal column examined. The ribs are rarely broken, on account of their great

elasticity. The child should be kept in his cot for a day or two; for the ceasing of some local swelling and tenderness may prove that a joint had been sprained, or periosteum bruised.

The **femur** may be fractured at the birth of the child, especially if the presentation be the "breech," and the delivery be assisted by the blunt hook. Dr. Peckard* quotes an instance in which the femur had been fractured within the uterus, and had become consolidated before birth. He also remarks that cases of spontaneous fracture are more common in the femur than elsewhere, by reason of the great leverage afforded by the length of the bone; and he gives the record of a case in which the leg doubled up as the child was simply walking across the floor, from the thigh bone having given way in the middle of the shaft.

The **treatment** of a broken femur in a child is a simple affair. For an infant at the breast, or in arms, I am content to bandage the two limbs together, from the feet and ankles up to the pelvis; a few stitches may be used for securing the turns of the soft roller; some padding of cotton-wool should be placed between the ankles and knees. An infant at the breast obviously cannot be kept in bed.

Broken thighs in children always do well; extension and counter-extension are not wanted, for there is no over-lapping, and all that is necessary is to keep the little patient at rest and protect the limb from disturbance. Or the limb of the damaged side may be enclosed in a doanette roller, and the thigh surrounded with nail-boards, or with lateral splints of plaster of Paris. If the case be treated by the stirrup and weight, the drag on the limb should be sufficient only to steady it. Perhaps there is no better way of treating the case than by means of a Thomas's hip splint (page 416), but in private practice an apparatus

* Ashurst's "Encyclopædia of Surgery," vol. iv., p. 230.

to fit is not likely to be ready at hand. The same remark applies also to the *box splint*. But if a box splint be used, the simpler it is the better.

Whatever be the kind of apparatus selected, it must not hurt or chafe, require frequent readjustment, nor become spoiled from being wetted or soiled. Perissed bands must not be used.

The **lower epiphysis** of the femur becomes joined to the shaft at about the twentieth year. It may be separated from the diaphysis, tearing away much of the periosteum from the shaft. Unless the case were seen directly after the accident, the exact diagnosis might be obscured by effusion; lateral movement, and possibly crepitus, would be the chief signs. It is hardly likely that there would be much displacement, unless the violence were great, or the fracture compound. The injury would be best treated by placing the knee in slight flexion. A small *McMurray splint*, or a small *plastic* one moulded on the limb, will maintain the surfaces at rest; with the latter splint, the patient could be moved about. The part must be inspected from time to time without disturbing the fragments, as suppuration is apt to complicate the injury. If the fracture were compound, amputation might be advisable, especially if there were much injury to the vessels, nerves, or other soft structures. Sometimes the separation of the epiphysis is associated with a vertical fracture into the joint. At other times the violence stops short of the separation of the epiphysis, but causes an oblique fracture into the joint between the condyles.

In these cases, the looseness of the condyle points to the nature of the injury. The knee should be put up almost straight, but permanent stiffness of the joint should supervene. The even compression of a jacking of cotton-wool inside a plastic splint will be found very comforting.

The **tibia**; the upper epiphysis, which includes the tubercle, is united with the shaft at about the twenty-fourth year, the lower joint at about twenty-one. In *simple fracture* of the bone of the leg in childhood, the most convenient treatment will be with the lateral splints of plaster of Paris. The knee can thus be bent, and the limb laid on its side; in this way all tension is taken from the gastrocnemius. The even compressive, if applied early enough, prevents the occurrence of swelling, and ensures rest.

If a rickety child be the subject of fracture in the thigh or leg of a valgus or otherwise deformed limb, the parts should be arranged so as to effect the greatest amount of improvement in appearance. During the confinement of the child in bed, the other limb, if that be also deformed, may undergo considerable improvement.

COMPOUND FRACTURES.

In children, compound fractures do better than in adults; the kidneys of children have not been damaged by high living and alcoholic irritation, nor has the nervous system been shattered by overwork, and by the worry and anxiety inseparable from the struggle for existence. Suddenly incriminated from lessons or play, the child's present and future are as free from care as the past is from regrets. Children live from day to day, and, like the lower animals, which in many respects they closely resemble, they bear serious injuries with patience, and very often surmount them with triumph. The popular idea is that a child must fret and grow thin if kept in bed week after week; children bear confinement better than adults, as a rule, but parents are apt to deal with them injudiciously when they are in bed; kindness should include firmness. Children in a hospital ward are generally

more unmanageable or troublesome on the evening of "visiting day."

Treatment.—Even if a main artery be torn through, as may likely happen with a compound fracture near the ankle or elbow, the limb is not necessarily to be considered for amputation. A limb mangled by machinery will be very likely to be found least put off surgery; but if there be a doubt in the surgeon's mind as to whether he should amputate or attempt to save the limb, he should give conservatism a trial. Mr. Holmes puts this matter very clearly: "In any doubtful case, the limb ought to be preserved until the onset of gangrene renders persistence in the attempt to save it no longer justifiable."

Before the final decision is arrived at, the child should be put under an anæsthetic, and the limb above the wound firmly surrounded by a few turns of an elastic band (not a cord, as that is too apt to injure the soft tissues), and a careful inspection made. All dirt, foreign bodies, or loose pieces of bone, should be carefully picked or syringed out. Main arteries should be looked to, and, if lacerated, tied above and below the tear. If a large nerve be found torn across, its ends should be held together by one or two fine catgut sutures. Provision must be made for drainage, the edges of the wound brought together by fine sutures, and the entire limb bandaged and fixed on a splint, and the child, of course, kept in bed. The primary washing may be with a weak solution of carbolic acid, corrosive sublimate, or even pure water; and the dressings may be those of Lister, of iodoform wool, or of dry lint. An even compression around the wound will be a valuable therapeutic aid; the less that the parts are disturbed the better.

Traumatic gangrene.—As regards the time for operating should gangrene supervene: If the fingers or toes become blue, and the discoloration

monad, or if the entire limb below the wound be found, in the course of a day or two, devoid of sensation, chilled and unwholesome, amputation should be performed straightway, and as far above the fracture as may be necessary for obtaining sound skin for liberal flaps. There should be no waiting for a line of demarcation. Wine and quinine will be required, and small doses of perchloride of iron at short intervals. Opium should be administered as may be necessary, a careful look-out being kept against its toxic effects.

Case.—A little girl of two years had her left wrist caught by the blade of a chaff-cutting machine. The tendon of the flexor carpi ulnæ was cleanly divided, as were also the ulnar nerve and artery, and some of the wires internal of the flexor tendons of the fingers. The ulna itself had been cut through; the wrist joint was freely opened; the metacarpus sacroformis had escaped. The case was treated on conservative principles; when the wrist was examined six months later the joint was found capable of fair movement. In another case of a very similar nature, on account of the injury received by the ulnar epiphysis arrested growth of that bone resulted, with the production of a club-hand.

Fracture of the skull.—Children may recover from desperate injuries to the head, for the cerebral system is in an imperfect stage of development. A severe lesion may be attended with but slight symptoms. One has seen the side of the skull deeply indented from a kick, a great portion of the parietal bone being thrust inwards, yet with time, and without interference, the elasticity of the bone has effaced the dent, and all signs of disturbance have passed away. Even with the immediate supervision of symptoms of compression, the surgeon should hesitate before proceeding to trephine. Nature should be

afforded full opportunity of working recovery in her own way.

On account of the thinness of the skull bones, punctured wounds of the brain are apt to occur, but though the instrument causing the puncture may have been driven several inches within the skull, still no symptoms may arise. Later on, however, suppuration may occur in the course of the wound, with symptoms of osteomyelitis, in which case trephining will, of course, be demanded.

Traumatic cephal-hydrocele is met with only in childhood. It is the result of a fracture of the vault of the skull, with escape, beneath the aponeurosis, of cerebro-spinal fluid. If the fracture were compound there would be no subfacial tumour, as the fluid would run away through the skin wound. The wave of intracranial pulsation may be transmitted through the dense to the swelling, but pulsation is not always present. There may be but little constitutional disturbance, and recovery often takes place.

Several cases are alluded to by Hüller, in his article in the "*System of Surgery*."* In a child under the care of Hey, of Leeds, in 1809, a watery fluid was discharged from a compound fracture of the forehead for three weeks. Another child recovered after the escape of fluid following an injury caused by a kick. In another case a pulsating tumour, occurring after simple fracture in the frontal region, was tapped with a fine trocar. The child eventually died, and it was found that a probe could be passed through the fracture into the brain. Gollie has brought forward two other instances: An infant of eight months fell from a height on to the head; a pulsating tumour occurred, which was punctured, a muddy fluid being withdrawn. The

* 3rd edition, vol. i., page 296.

† *Medical Times*, Jan. 30, 1885. See also *American Journal of Medical Science*, July, 1888; and *Guy's Hospital Reports*, 1894.

infant died. An examination showed a large hæmatoma, which communicated with the interior of the descending cornu of the lateral ventricle by means of a wide gap in the parietal bone. The other case is very similar; at the autopsy the bone was found very thin, and partially absorbed. The question as to the cause and the nature of the absorption of the bone tissue at the seat of fracture is an interesting one. Probably in most of these cases there is rupture of the cerebral ventricle. When the brain is lacerated, the fluid will be chiefly derived from the descending cornu of the lateral ventricle. Some of it may be the result of inflammatory effusion, and some, especially when the tumour is associated with recent injury, may be blood serum. Should the fluid become purulent, the gravity of the prognosis, which is always considerable, would be much increased. Large amounts of discharge do not necessarily entail a fatal issue, but sooner or later, in any case, meningitis may supervene. The pulsating tumour must be taken as evidence of the existence of a fissured skull, and of damage to the dura mater and arachnoid, possibly, also, of the brain itself.

Treatment.—No further active interference than the occasional tapping of the tumour would be generally advisable; if suppuration ensued, free incision, antiseptic washings, and drainage would be demanded. Exploration and trephining would be of very questionable value. The exertion of a certain amount of pressure by pad and bandage might serve. The child should be kept quiet, and fed on milk and water. The condition of the bowels and of the bladder should be attended to.

CHAPTER XXVIII.

DISLOCATIONS.

Dislocations from injury are extremely rare, for the simple reason that violence to a bone near a joint is much more likely to expend itself in detaching the epiphysis.

Of traumatic dislocations, the only one that is at all likely to occur is that of the bones of the forearm backward, the coronoid process of the ulna being at the same time detached. In a series of fifty-six dislocations at this joint (Hamilton), twenty-two occurred in children.* Out of seventy-three recorded by Flower "more than half occurred in boys between the ages of five and fifteen."† Holmes also speaks of this dislocation as being common in childhood.‡ On the other hand, Mr. Hutchinson writes: "To a large extent, I feel sure that the popular belief as to the frequency of clean dislocations at the elbow in children is a mistake."§ My own experience, and I give it with considerable hesitation, opposed as it is to that of the three authorities whose names are grouped above, is that simple dislocation of the bones is an uncommon injury.

The dislocation having been reduced in the ordinary way, the elbow had better be enclosed for a fortnight or three weeks in a moulded splint. In an unhealthy constitution chronic inflammation is apt to supervene on the severe injury to the synovial membrane. (For differential diagnosis from separation of epiphysis, see page 385.)

* "Fractures and Dislocations," page 588. 4th edition.

† "System of Surgery," vol. II., page 628. 2nd edition.

‡ "Surgery of Children's Diseases," page 251. 2nd edition.

§ Medical Times, Jan. 5th, 1884.

There have recently been under treatment two children with dislocation of the **radius forward** from injury. One case had been an uncomplicated luxation, the other had been associated with fracture of the humerus into the joint. The former case was of some months' standing, and did not prove amenable to treatment.

Luxation of the **proximal phalanx of the thumb** may require excision of the head of the metacarpal bone.

Of **congenital dislocations**, the most important is that of the head of the femur. The luxation may exist on one or on both sides, and is more often found in girls than in boys.

The **signs** of the dislocation are not, in infancy, characteristic. The probability is that the lesion will pass unrecognised until the child begins to stand, when, from the centre of gravity being in advance of the normal line of support, the equilibrium will be unstable. If luxation be symmetrical, the child develops incurvation in the loins (*lordosis*) in order that the centre of gravity of the body may be restored to the proper situation by bringing the upper part of the body well backwards. (But if the deformity be unilateral the thigh of that side will be foreshortened and flabby.) Thus the abdomen is rendered prominent, and the buttocks large and salient. When the subject is in the horizontal



Fig. 98.—Congenital Dislocation of Femur.
(After Brodhurst.)

position, the chief characteristics of the luxation become effaced. Where the affection is unilateral, there may be difficulty in forming a positive diagnosis. The child walks with a reeling gait. The chief points in the differential diagnosis are the absence of pain both in the knee and in the hip; the shortened limb can be drawn down to the normal length by steady traction, the child showing no evidence of distress; the thigh bone can be rolled and everted in its bed upon the dorsum of the ilium. The top of the great trochanter is found above the line which is drawn round the buttock from the anterior superior spine of the ilium to the tuberosity of the ischium.

A simple and exact way of comparing the length of the lower extremities in this or any other condition is to lay the child flat upon the back, with the pelvis squared, and, having straightened the knees, to bring the soles of the feet up towards the ceiling. The difference in the level of the heels and the malleoli becomes at once apparent.

Pathological anatomy.—Mr. Brodhurst teaches that the cause of the dislocation is mechanical. "This dislocation never occurs except with a pre-natural lacer, and it occurs especially with a pro-sarvation of the nates."⁴ This theory is, however, by no means proved. My own opinion is that the "displacement" is secondary to imperfect development of the joint, possibly from injury received at birth; and that it by no means resembles a traumatic luxation.

The anatomical changes are these: a rimless shallow or a plain surface may mark the site of the acetabulum. The femoral head is misshapen, and the neck ill-developed, and much advanced. The capsular ligament may be found loose or unrecognisable. The thigh will be flabby and shortened. The great trochanter will be brought nearer to the iliac crest, and

⁴ "Lectures on Orthopædic Surgery," page 503. 1874.

will be extremely prominent amongst the undeveloped muscles. The inversion and fixation of the limb, which are so characteristic of traumatic dislocation, will not be found. The fact of the limb being capable of performing most of the normal movements, though, of course, in a limited degree, is evidence that the dislocation is not traumatic. The quietude of the muscles is opposed to the theory of the displacement being due to spasmodic contraction.

Treatment.—The displacement is usually diagnosed only as the child begins to walk. If the deformity be unilateral, the wearing of a raised boot may improve the power of walking; it will also be necessary to prevent the invasion or increase of lateral spinal curvature (page 362). The inconvenience of the deformity is not sufficient to warrant the resort to any speculative operation, with the view of improving the position of the undeveloped femoral head. I have at present under observation a grown girl with congenital luxation, and by keeping the boot raised in proportion with her growth, the ill effects of the deformity are little noticeable. In a case of double dislocation under Smith, the walking was at first extremely difficult, but at twenty years scarcely any trace of the peculiar gait could be discovered.*

The **differential diagnosis** is from true hip joint disease (page 410), and infantile paralysis. In the former condition the thigh will be kept rigidly fixed, probably in the flexed position, and any attempt at eversion of the limb whilst the pelvis is fixed will be attended with pain and distress. From the effects of infantile paralysis the diagnosis is not difficult, as after paralysis the movements at the joint are all too free. In every case the history will afford help.

In comparison with that of the hip joint, no other congenital displacement is possessed of much practical

* Quoted by Hamilton, p. 178. with addition.

inspection. Rarely the **tibia** is found partially **displaced forwards** upon the femoral condyles at birth, the toes pointing towards the infant's face. But little difficulty will be found in bringing the leg down straight, and this being done, the knee should be kept extended on a well-padded splint. Subsequently rubbings and shampooings will render the joint sound and trustworthy.

I have seen one well-marked instance of congenital dislocation of each **radius backwards**. The head of the bone lay quite behind the lower end of the humerus; the lesion, but little affected the strength of the joint. The luxation, if noticed soon after birth, might be reduced, but no cutting operation need be undertaken for its improvement.

Congenital dislocation of the patella.—With knock-kneed children, the patella is necessarily displaced considerably outwards. In the case of the congenital dislocation, attention may be drawn to the condition only after the receipt of some accident, as in the reports brought before the *Univ. Socy* * by Messrs Golding Bird and Godlee. The condition is to be revealed by massage, and by the wearing of supports.

CHAPTER XXIX.

HIP JOINT DISEASE.

THE term hip joint disease is convenient in that it conveys a definite idea of one or more of a series of pathological changes which frequently affect that joint in childhood. It should not suggest, however, that these morbid conditions differ from those which may

* Oct. 24, 1884.

ordinarily be found in *stiff articulations*. Whatever the stage of the disease, stiffness of the joint will be always the chief objective sign. The cause of the stiffness varies with the stage.

Though the disease may take origin in the bone, the epiphyseal cartilage, or the synovial membrane, and thence implicate the entire articulation, my individual opinion is that it is most often started by a strain of the ligamentum teres. Thence, by continuity of tissue, it may quickly spread, and end at last in suppurative arthritis.

Digital exploration of a suppurating joint often shows, that though the articular cartilage is but little implicated, all trace of the ligamentum teres has disappeared. In Jacobson's edition of "*Bone and Pain*," important evidence is cited in favour of the ligamentous origin of the disease.

It is not of practical importance to attempt a diagnosis as to whether the disease exists chiefly in the femur, acetabulum, membrane, cartilage, or ligament; indeed, such diagnosis is rarely possible.

Barwell is of opinion* that the most common form of hip joint disease is that which begins as an inflammation of the epiphysis; thus the head of the bone becomes strophied, or disappears from molecular disintegration. He illustrates his remarks with a woodcut which shows a central abscess in the head of the bone, whilst the articular surface appears but little affected. Such specimens are comparatively rare, and rarer still are those in which the disease has apparently begun in the junction cartilage itself. In the latter circumstance the head of the bone is cast adrift in the interior of the capsule, where, on exploring the joint, or performing excision, it may be found bathed in pus and much eroded.

Though one cannot affirm that hip joint disease is

* Ashurst's "Encyclopædia of Surgery," vol. II., p. 383.

invariably the result of some remembered or forgotten injury, still, by careful questioning, one can very often learn that some weeks or months before the trouble began the child received a special hurt from a fall from the bed, a fall down stairs, or from a bench at school, or that he was pushed down the steps by some one as he was hurrying out from school. But, on the other hand, one may find the joint attacked in a patient who for a year or two has been bed-ridden and unexposed to any chance of injury. In a notable instance, just as one hip joint was becoming convalescent after very prolonged treatment, the other was attacked; in a second case the disease began after the boy had been two years or more under treatment for knee joint disease.

Mechanics of the disease.—If at the time of the accident the boy fell on to the outside of the partially flexed thigh (a very likely contingency), the *ligamentum teres* is submitted to serious strain. This may be proved in the dissecting-room by watching the working of the ligament through an opening made into the acetabulum from the pelvic side. Attached below and behind the axis of the head of the femur, the ligament checks abduction and inward rotation of the partially flexed thigh.

The course of the pathological events in the case of a sprained *ligamentum teres* cannot be followed as closely as can those of a sprained ligament of the ankle joint; but from analogy one can, in the mind's eye, see the *ligamentum teres* slightly injured after its rough usage. Then its substance is infiltrated with inflammatory exudation, and permeated with leucocytes, whilst the synovial membrane, which is virtually incorporated with it, is participating in the marked changes.

The ligament, which is now swollen and tender, can no longer lodge in happy disregard of the movements

which take place between the head of the femur and the depth of the acetabulum. Two conditions are therefore demanded: first, that the head of the femur shall be so placed in the acetabulum as to exert the least possible pressure against the swollen ligament; secondly that there shall be no sudden movement at the joint by which any bruising of the tender tissue may occur.

The first provision is obtained by the thigh becoming slightly flexed, for then the strong and unyielding part of the capsular ligament is rendered slack. The posterior part of the capsule is of no mechanical importance, whilst the anterior part is extremely thick (so that it may prevent the head of the femur leaving the front of the joint in violent extension). In flexion of the limb, this strong part of the capsule is loose, and the head of the femur lies gently against the bottom of the socket; the more that the ligament is tightened the more firmly is the femur forced against the floor of the socket.

The provision against sudden and jarring movements is accomplished by the muscles at the front of the joint being kept on the alert against interference from without. They are thrown by reflex influence into a state of watchful and shielding tension.

It is not that any one muscle more than another is thus concerned, though, from the prominence of its cord-like tension, one is in the habit of associating this function specially with the adductor longus.

Just as the shrouds are used from the hull of the ship to the head of the mast to steady it, so do these muscles, from the tensor fasciæ femoris on the outer side to the adductor longus on the inner, co-operate in the fixation of the thigh bone. Probably the most important service in this respect is rendered by the mass of *psoas* and *iliacus*.

As the synovial membrane becomes implicated, a

considerable increase of its secretion takes place, so that a painful tension of the *thorax capsula* occurs. How will the hip joint arrange itself so as most comfortably to accommodate this increase of fluid? The question is answered by experimentation: When fluid is injected with a syringe from the pelvic side into the interior of a freshly dissected hip joint, the first amount causes the femur to pass into the position of slight abduction, whilst a further injection determines its flexion towards the abdomen. From this it may be inferred that the greatest capacity of the joint is obtained, first, when the thigh is slightly abducted, and next when it is carried into flexion. It is to a large extent the effusion into the capsule which, in this stage of the disease, causes the fixedness of the limb. This also may be demonstrated by injection of the dissected joint, as well as by the effect of puncturing the capsule in the case of acute effusion (as detailed on page 421), when the position of the limb may be straightway improved or altogether corrected.

In the early days of hip joint disease, when the fluid is beginning to accumulate, the thigh may now and then be found in the position of slight abduction; but abduction passes so quickly into flexion as to go unnoticed; or it may be obscured by the flexion. One does not imply that the neo-synovial fluid of the inflamed joint forces the limb into these positions; but that, by the assumption of these positions the painful intra-articular tension is reduced to the minimum.

After flexion has accomplished its utmost in the diminution of the joint tension, and the anterior muscles are found by the timid patient not sufficient in shielding the inflamed area against accidental shocks from without or irregular startings from within, comfort will be obtained by resting the knee of the diseased side over the front of the opposite thigh; and, further, by bringing it on to the front of the

abdomen, or even up as to the chest itself, where the child can further steady it with his hands and arms, and with his chin. He has usually passed through intense and prolonged suffering before the limb has been compelled to take up this position of extreme flexion, adduction, and inversion.

Pain in hip joint disease is apt, like the cry of the plover, to decoy one from the object of the search. As a rule, and certainly so at the beginning of the trouble, it is located at the knee joint, over the patella, or along the front or the inner side of the thigh; that is, in the area of distribution of the terminal filaments of the obturator nerve. One filament of the obturator nerve has entered the hip joint for the supply of the ligamentum teres; but probably one cannot satisfactorily explain the cause of this neurotic eccentricity. An analogous phenomenon is met with in the case of pain referred to the end of the prepuce in vesical catarrh; sometimes in hip disease pain is referred to the calf.

The knee pain is worse after the child has been running about, and sometimes his mother finds him crying on account of it. It may cause him to start in his sleep, and this long before ulceration of the cartilage in the hip joint has supervened.

The pain is often ascribed to rheumatism, and so the poor child escapes treatment which is so urgently demanded. Sometimes, indeed, relief for the pains is ineffectually sought in the application of position to the knee, or of liniments to the thigh. Later on, pain occurs at the hip itself. This pain is increased, or its presence made evident, by gently pressing with the fingers in the middle of the base of Scarpa's triangle, or between the ischial tuberosity and the great trochanter. Also by firmly pushing the great trochanter inwards, or by gently rotating the thigh outwards.

The old method of diagnosis by striking the heel

or the great trochanter is unscientific and untrustworthy, as it does not help to differentiate between disease of the hip, of the sacro-iliac joint, or of the vertebrae. In each case pain would follow the blow, and the child, being thus hurt or alarmed, will burst out crying and spoil the case for further examination.

The **attitude** is characteristic. The intra-articular pressure being increased, the child cannot stand evenly upon his two feet; were he to do so, the head of the femur would be thrust up into the already distended capsule, and upon the swollen ligamentous tereæ. The thigh being already advanced from the



Fig. 75.—Limb brought down flat, but toes arched.*

vertical line, he supports all his weight upon the limb of the sound side, the other knee being flexed, and the toe gently touching the ground. When standing, he will be glad to obtain the support from a chair or table. When the deformity is great, he may not be inclined to attempt to stand or to walk, but will lie quietly and patiently day and night.

The **walk**, too, is characteristic, for the thigh being permanently advanced, and incompetent to transmit weight, the child limps uneasily, though silently, just touching the ground with the toe of the affected side, and pushing himself along. This method of progression soon tires him, and he gladly leaves his play to lie down. Shortening of limb in the early

* Many of the woodcuts illustrative of disease of the hip and knee are modelled from Thomas's excellent work.

months of the disease does not actually exist; it is merely the result of an acquired obliquity of pelvis. Presence of absolute shortening is usually associated with formation of abscess or ulceration; it may take



Fig. 70.—Lies flat, but Thigh cannot be brought down.

place without suppuration, being due to arrested development.

For making the **diagnosis** the child should be entirely stripped and placed supine upon a firm couch, or upon the table or floor. The diseased joint being stiff and partially flexed, it follows that when both



Fig. 71.—Sound Thigh Bent on Abdomen for ascertaining exact amount of Deformity.

thighs are brought flat down a compensating excavation (Fig. 70) is established at the loins, beneath which the hand can be easily passed. This loin arch can be effaced by raising the knee (Fig. 71). The cause of this important diagnostic measure is, that the thigh being advanced and rigidly fixed at the acetabulum, a virgious but servicable joint has been developed in the

lumbo region, the rigid system of femur and pelvis becoming capable of greatly increased flexion and extension on the spine. When the limbs are flat upon the table, and the pelvis is squared, the amount of the fixed flexion becomes manifest. So as to be certain that the limbs and pelvis are flat and square, the sound thigh should be fully flexed upon the chest (Fig. 72).

This usually shows that the hip joint is stiff, but the stiffness may be due to adhesion in the sheath of the psoas or iliacus, and certain other conditions from which a differential diagnosis must be made. This is done by flexing the thigh of the damaged side a little farther, and then gently rotating it. Sometimes a child will bravely endure the pain as long as possible, and then burst out crying; so during this manoeuvre the face must be watched for the slightest expression of pain; if he become hurt or frightened the value of the examination is destroyed. Unlike adults, children cannot generally give much definite information as regards pain, but, on the other hand, their complaints always demand careful consideration. The oft-repeated cry of, "My leg does ache!" should not be disregarded. If the child allow the head of the femur to be gently rotated in the acetabulum without complaint or expression of pain, there is no disease of the articulation; cause for the stiffness must be sought elsewhere.

If, when the subject of diseased hip is lying on the back, a gentle attempt be made to abduct and rotate the thigh outwards, the pelvis and the whole body will follow the guiding movements rather than allow of disturbance between the femur and the acetabulum.

To obtain the confidence of the little patient, the examination should always be gone through first with the sound limb.

Differential diagnosis.—If, when the thigh has been partially flexed, rotation is permitted, the

stiffness may be due to spinal or iliac abscess rendering the sheath of the psoas or iliacus full and tense (page 246); inflammation of the bursa, which intervenes between the psoas tendon and the capsule of the joint (a rare contingency); gluteal or other extra-articular abscess; peritonitis of the upper end of the femur (page 346); congenital displacement of the femur (page 399); or to infantile paralysis (page 353).

Deformity.—As soon as the pelvis is brought square with the spine, and the lumbar vertebrae are

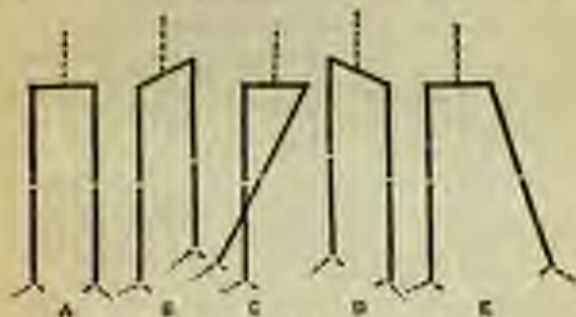


FIG. 71.

all flat upon the table, the amount of deformity may be accurately determined. Apparent shortening is then explained, and a limb which hitherto might have been considered to be in good position, may be found of normal length, but flexed and greatly adducted. The schemes represent: (a) pelvis and lower extremities in every respect normal; (b) disease of the left hip joint, tilting of the pelvis, the left limb being apparently shortened but in the normal line; (c) shows how, by the squaring of the pelvis, the limb has been brought down and found greatly adducted, yet of normal length; (d) represents disease of the left joint,

the pelvis having been tilted (possibly dropping from want of the accustomed support) so that the left extremity seems increased in length, though still in normal parallelism. But on bringing the transverse line of the iliac crests at right angles with the spinal column, as in (8), the left limb is found of normal length but greatly abducted.

Supplemental signs of the disease may be



Fig. 71.—Disease of Right Hip Joint. Buttock widened and flattened, and gluteal fold dropped from normal level.

falsehood beneath the middle of Poirpurt's ligament, due to intra-articular effusion; a flattening and widening of the buttock, together with a dropping of the gluteal fold, and a loss of symmetry where the line of the gluteal fold meets the median line of the body. The widening of the buttock is due to the slight thrusting out of the head of the femur from the depth of the acetabulum by the intra-articular effusion; it may be initiated on the capsule. The flattening is due partly to the widening of the buttock, but chiefly to atrophy of the

gluteal muscles; not merely from want of use, but to some peculiar trophic change, the nature of which is, perhaps, not thoroughly understood. Wasting of the neighbouring muscles is an early and constant sign of joint disease.

With the least suspicion of disease of the joint, the surgeon should never be content to await the further development of signs before inaugurating treatment. Even if he think the boy has but "sprained" the joint he should at once put him to bed and apply the stirrup and weight; only having done this should

he assume the expectant attitude. Disappointment will follow the promise that the child will "grow out of" his obscure troubles. Treatment effects most in the early and apparently equivocal stages of the disease. When the symptoms are not sufficiently clear for absolute diagnosis the child should be kept in bed till every suspicious feature has passed off; he must not be allowed to run about until the nature of the disease is evident even to the unskilled. Nor should the treatment at any period become half-hearted, either because the child finds it irksome or because the surgeon has in distant view the alternative of excision.

The **treatment** will vary somewhat with the stage to which the disease has advanced, but the principles are unchanging; they are the assurance of absolute and interrupted rest for the joint, and correction of the deformity. As a rule, the only drugs required will be cod-liver oil, iron, quinine, and an occasional laxative. The oil should be given in small doses, and not persisted in if it makes the child sick. In large doses it may cause diarrhea.

In the early days, when perhaps there is nothing worse than a slight effusion, and signs are slight, confinement in bed is eagerly required. Even if no other signs of the disease exist than that of obscure pains in the limb, and an unwillingness to have the thigh moved, there may be little doubt as to the presence of incipient disease. Hip joint disease would not be so desperate and often intractable a complaint if only it were diagnosed and dealt with in the early part of its course.

When confined in bed, the child should never be allowed to sit up, for that would be to flex the pelvis on the femur. He must be kept absolutely flat, and should be allowed but a thin pillow. If he will not submit to the horizontal position, it may be enforced

by the application of appesprade armlets, which consist of two small circles of webbing, which are run over the arms and up to the shoulders, and fixed together by a short band of like material, which passes across the front of the chest. Then a long piece of roller bandage or webbing is run through them, across the back of the shoulders, and secured to the frame of the bed.

Weight and pulley.—Every case of hip joint disease should, from the very beginning, be treated by means of Thomas's splint; but, unfortunately, parents are often too poor to find the fifteen or eighteen shillings necessary for the purpose. In private practice I invariably start treatment with that splint. But in those cases in which it is not procurable, excellent fixation may be obtained by a weight of from three to eight pounds, suspended from the leg (Fig. 75).

To apply the stirrup. a strip of Leslie's soap strapping is cut, long enough to form an ample loop below the foot, and to reach up on each side of the leg to a little below the knee. The strip is narrowest in the middle, and there, upon the adhesive side, is laid a slip of deal, three inches long by two wide, with a hole bored through the middle. Extending for a few inches beyond the ends of this piece of wood is placed another strip of strapping, with the adhesive surface towards that of the other slip, the wood being between them. This second strip is to prevent the loop of the longer one adhering to and irritating the nullooli when the stirrup is fixed, and also for securing the wood. The wood is for holding the strapping away from the sides of the foot and ankle. Before applying the long strip to the leg, the ends may be notched, to make it fit closer. When adjusted it should be secured by a soft roller, the weight being applied when the strapping has obtained

a firm hold. Then the cord is passed through the strapping and wool, a knot is made at the upper end of the cord, and a weight or shot-lag is hung at the other, the cord being passed over a pulley. The pulley may be made of a cotton-wool, which has running through its axis a steel knitting needle, which is to be firmly fixed to two of the upright bars of the cot, at the proper level.

The traction must always be in the axis of the femur; if it be arranged only in the axis of the body,

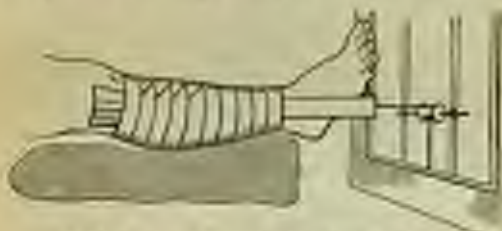


Fig. 74.—Strap applied. Leg raised on pillow.

the apparent improvement in position is obtained by a still further tilting of the pelvis, or by arching of the loins. From time to time, as the thigh can be brought flatter without arching the loins, the pulley must also be lowered. Some surgeons prefer thus to correct the deformity before applying the Thomas's splint, instead of using the splint from the beginning.

When there is so much flexion of the thigh that the pulley has to be considerably raised in order to keep the traction in the line of the thigh, a wedge-shaped pillow may be placed beneath the leg, for the sake of support; it will be made thinner as the limb comes down (Fig. 75).

The bed clothes must be folded from the elevated leg and foot by a light frame or cradle.

Occasional paroxysms of pain may be relieved by the application of a blister, near the region of the joint, or by a touch with the thermo-cautery; but such measures are very rarely required.

Appreciation.—The weight and pulley have great effect in relieving pain and correcting deformity; the former is accomplished by the rest secured to the joint and to the apprehensive muscles. The weight does not draw the head of the femur from out of the acetabulum; this is rendered mechanically impossible by the strong anterior part of the capsular ligament, as experimentation on the cadaver proves. The head of the bone might be drawn somewhat out of the socket if at the same time the flexion were increased, but in its effect at bringing *down* the limb the strain is brought to bear on the front of the capsule. The weight upon the leg thrusts the femur farther into the socket, and increases the intra-articular pressure, but the compression is so even and steady that it is comforting to the injured joint, and promotes absorption, just as the external compression may do in the case of knee effusion.

Thomas's splint consists of a flat piece of malleable iron $\frac{1}{2}$ in. \times $\frac{1}{8}$ in., and long enough to extend from the level of the inferior angle of the scapula, down the loins and pelvis, between the great trochanter and ischial tuberosity, and to the bottom of the calf. If the thigh be but little displaced, only slight bending of the bar will be required to make it lie easily along these surfaces; the line given to the bar is represented in Fig. 27.

For converting the bar into a splint three cross pieces of iron are riveted on, one at the top which is to be bent around the chest, a second to grasp, but not to encircle, the upper part of the thigh, and a third to receive the leg. These cross bars are of deep metal, so that they may be easily bent; steel will not

do. The metal frame is then pulled with a single layer of boiler felt, and covered with buck leather. The mattress on which the child is laid should not be so hard that the splint is pressed unfairly against the skin.

Particulars for the manufacture and application of the apparatus are given in Thomas's book.*



FIG. 78.—Method of fitting Child with Hip Joint Splint, in Thomas's Splint.

The splint secures the joint against all chance of movement, for it fixes the trunk as well as the limb; it is light, and fits close to the body, which rests comfortably upon it, the patient being secured within it by straps and buckles, and by soft bandages. The splint may be covered from time to time with a strip of old soft linen; this will give comfort to the child. The greater the deformity, the more, of course, must the splint be bent around the buttock; but after the apprehensive muscles have enjoyed a few days' rest,

* "Diseases of the Hip, Knee, and Ankle Joints."

the thigh can be brought down faster without any arching of the loins.

Whilst undergoing treatment, the patient and splint may be conveniently carried from room to room,



Fig. 77.—Dress of Right Hip Joint, splint applied, patient beneath foot.

or out into the fresh air, by any one who has had a little experience in the lifting. Fig. 76 shows the manner of lifting, and how securely the joint is protected as the patient is moved.

High amongst the advantages of the method of

THOMAS is this, that when the limb has been brought down straight, even though disease be only just becoming quiescent, the patient may be taught to walk out, and even attend school, without interference with the progress of the cure. This is accomplished by raising the sound foot four or five inches, by a clog or patten fixed beneath the foot. It is important that the strumous child (and many subjects of hip joint disease are strumous) should be able to enjoy the fresh air and sunshine, and even take exercise, whilst the cure is being wrought. "I wish I had words at my command," says Macnamara, "to express my strong feelings regarding the importance of allowing patients suffering from incipient symptoms of tubercular disease of the bones to move about without injurious pressure on the affected tissues. It is a painful sight to see patients of this kind confined in the close rooms, or the wards of our London hospitals, at rest, until they have passed into a hopeless condition of general ill-health."



Fig. 76. — *Wood Patten*, to be screwed in side of foot of sound foot.

In his article in Ashurst's "Encyclopædia," Barwell pays scant attention to Thomas's splint; though he faintly perceives it, he remarks that the successful results which he has had from its use were in early cases or with docile patients. One of the many defects which he sees in it is that "high-spirited lads are constantly, by some means or other, getting their weight on the diseased limb (not, of course, during the acute and painful stage, but afterwards), and thereby prolonging the disease." But having now used the splint for a good many years, and in cases of every stage of the disease, and in all sorts of patients, from the diffident girl to the headless boy, I

affirm that the more I see of its working the more highly do I appreciate it. My experience is, that however rough and active a boy may be, he is always particularly careful about the way he treats his weak limb. That he may now and then get a fall or a hurt must be submitted; but the limb is fixed so securely that a day or two in bed will generally suffice to put matters right again; after this he is more careful than ever. But for Thomas's splint, scores of unhappy children would to-day be still in bed, who are now in the fresh air hurrying on the progress of cure. Lastly, the more that one uses the splint, the less becomes the probability of erosion or disarticulation; of this I feel confident.

Any splint designed to allow some movement at the joint during the treatment must be wrong in principle and unsatisfactory in practice. The demand for absolute rest for the inflamed joint is as urgent as is the absolute darkness to which the patient with acute retinitis is consigned.

When may the splint be left off? is a question which is often put in the progress of the case; the best answer is, "When the child is well." Relapse is often the direct result of discharging it too early. The prolonged wearing of the splint is not the cause of the ankylosis which may follow its lengthy employment; I have seen a child recover with free movement in the joint after continuous wearing of the splint for several years. When all deformity and pain have passed away the splint may be remitted at night, and then gradually the child may go about without it in the day, his high boot or clog, and crutches, protecting the weak limb. Later, as he walks and sits about, the movement will gradually return if the function of the joint have not been destroyed in the course of the inflammation. Prolonged rest of the joint is not of itself sufficient to leave it permanently stiffened. On no account,

therefore, should movement be imparted during the treatment; the rest must be "absolute and uninterrupted." When criticising the treatment by extension and movement, Thomas suggests that "the best commentary upon this method is the remarkable frequency with which its principal advocate has had to perform excision of the joint."

The surgeon must be cautious in pronouncing recovery from hip joint disease as complete. A child, Boon Carpenter, who had been under treatment for about three years, was on one occasion shown as an instance of complete recovery with freedom of movement. Some months after this, relapse occurred, and Aristostol Lane was compelled to excise. Later on the child had osteomyelitis of the femur, and suppurative arthritis of the knee; for this Furness Jordan's amputation was performed (page 429). The child is now well, and fat.

Abscess is a frequent complication. It may come on quietly, without local or constitutional disturbance. Or it may supervene rapidly, with intense pain. There may be sleeplessness, loss of appetite, and convulsions; the rigors of childhood. At the same time the hip is swollen and extremely tender; the axillary temperature rises. If increasing pain and swelling suddenly subside, the thin posterior part of the capsule has probably yielded to the pressure of joint exudation.

On the formation of pus, the limb, if previously in good position, though not on the splint, becomes rigidly fixed. On puncturing the capsule with canula and trocar painful tension may be relieved, and an improved position of the limb obtained. There is a peculiar springy resistance in the limb which is fixed by acute effusion in the capsule, and there is generally a distinct bulging to be made out about the head of the femur. The puncture may be made through the gluteus maxima, and into the back of the joint, or by working

inwards from below the anterior superior spine of the ilium. On account of the position of large vessels the joint could not be tapped from the front. The prompt relief of the acutely distended joint is an important therapeutic measure. One does not hesitate to aspirate the acutely distended knee, and why should there be so much delay in the case of the hip? Mr. T. N. Fitzgerald, of Melbourne, passes a *tenotomy* knife into the articulation, allowing the fluid to escape into the surrounding tissues and so to be absorbed.

When definite suppuration has taken place, and is rising towards the surface (the capsule having probably given way,) the pus should be withdrawn by several aspirations, undertaken at short intervals; a single aspiration will rarely suffice. If the pus find its way along the course of the puncture wound, the abscess cavity should be laid freely open, thoroughly washed with antiseptic solution, and provision made for drainage; a thick pad of salicylic wool or carbollised tow makes an excellent dressing. The Thomas's splint, which should be worn all the time, may be protected from the discharge by a little waterproof covering.

If the abscess be chronic, and its approach to the surface gradual and painless, it may be allowed to find its own escape. The farther that it wanders down the thigh before cutting through the skin the better is generally the result. After it has "broken," the thigh should be firmly compressed by a roller bandage, applied over an ample pad of carbollised tow. A favorite place for pointing is near the great trochanter, that is, in front of the cover of the gluteal muscles. Some few abscesses reach the surface just below the middle of Poyzart's ligament. The opening of abscess through the front thick part of the capsule is of rare occurrence.

Case.—A child had been for some time under treatment when suppuration occurred at the base of

Scarpa's triangle. On opening the abscess, an aperture, of the diameter of a pea, was found in the strong and healthy-looking capsule, and through it the movements of the smooth head of the femur could be seen and felt. The abscess had burst through the perforation by which the bursa of the psoas communicated with the synovial membrane of the joint. Unfortunately no counter-opening was made through the gluteal region, and the joint could not be kept drained. On excision being performed some weeks afterwards, the child made rapid recovery.

Strengthening under chloroform may be resorted to in some few old-standing cases, where the deformity is being kept up by fibrous adhesions rather than by intra-articular effusion or muscular contraction. It should be undertaken with gentleness, and not to the full extent on the one occasion. But, gently as it may be done, it is very apt to be followed by the formation of abscess. In more cases, however, a little help is required just to start the improvement. Bone-setters do infinite harm in attempting to "put in" such "dislocated" hips. In one case, from empirical manipulation, the head of the femur was thrust right into the pelvis, this fact being revealed at the autopsy.

Subcutaneous division of the tendon of the adductor longus or of the tensor fasciæ femoris need rarely be resorted to if the use of the weight extension or of Thomas's splint be efficiently carried out.

In direct opposition to what I had long believed and taught, I am now convinced that **dislocation of the femur**, from hip-joint disease, is an extremely rare occurrence. Thomas goes so far as to say that he has never met with an instance of genuine dislocation from disease. Certainly the upper border of the great trochanter may often be found above Nelaton's line, whilst the shortened, fixed, and inverted position of

the limb appears highly characteristic of the dislocation. But this may generally be accounted for by the diseased and undeveloped condition of the head and neck of the femur, the ulcerated state of the acetabulum, and by the chronic inflammatory thickening about the joint. On occasions in which the appearances of dislocation have been apparently unequivocal, and in which excision has thereto been performed, the joint has been found open behind, and with hardly any femoral head or neck existing.

Prognosis.—Months or years may pass before the disease has entirely disappeared, whilst however prompt and efficient the treatment may have been, some deformity may remain. Children may recover absolutely from the disease; but in such cases the constitution has generally been good, the disease vigorously treated, and the supervision long continued. But even after long-continued suppuration the abscesses may heal, and freedom of movement ultimately return to the joint; this is particularly likely to supervene when the case has been one of suppurative synovitis rather than arthritis. Perhaps the disease will end in true ankylosis, when, if the limb be in a good position, the result must be considered as satisfactory. Abscess may form, and the patient sink from exhaustion or intercurrent disease; or albuminuria may occur from amyloid degeneration.

Permanent shortening of the limb is apt to follow on the most skilful treatment of the disease. There may have been no formation of abscess during the months or years of absolute rest, yet it may be inevitable that the limb may be found shortened by as much as one, two, or three inches. The cause of the shortening is the interference with the nutrition of the epiphysis, and a consequent arrest of development. Sometimes the shortening is associated with slight or considerable inversion of the limb. Back version

might have been amenable to treatment at its onset, but it should then be dealt with gently, never with violence, lest acute suppuration or separation of the epiphysis result. The possible occurrence of shortening should be thoroughly recognised at the outset of treatment, lest disappointment or even unjust reproach be entailed. Caries alone may cause absorption of the head of the femur without suppuration.

Synostosis in faulty position should not be interfered with directly the disease appears at an end; the patient's health should be improved, and the parts allowed to consolidate. The thigh must not be brought down by forcible manipulation, as this may awaken the old articular trouble. There are various plans of dividing substantially the upper end of the femur. Keetley prefers to cut through the neighbourhood of the joint itself with a bone chisel. Others would rather keep away from the seat of the disease, dividing the femur with a slender but trustworthy saw, just below the great trochanter, washing the skin, and then puncturing it and the deep fascia with a clean tenotomy knife. The course for the saw blade through the muscles is cleared by a firm director. When the section of the bone is almost completed, a sudden and sharp jerk finishes the operation. Dry dressing and a splint are then applied. No attempt should be made at keeping up a false joint. Absolute cleanliness during the operation, and at the subsequent dressing is, of course, demanded.

Double hip joint disease.—In several cases, the second joint has become quietly affected when the child has been lying many months in a position of perfect rest. Such children are best treated by Thomas's double apparatus. The limbs must be placed in the straight position, for should ankylosis supervene in an abducted position, progression would ultimately be accomplished with great inconvenience and

maighilliana. Such **scissor-legged deformity** is fortunately rare.*

In the case of double hip joint disease the existence of some such condition as that which is conveniently termed "struts" (page 51) is forcibly demonstrated. It is unlikely that on each side the disease should be of simple traumatic origin. Again, one frequently meets with the co-existence of hip and spine disease; of hip and knee disease, of hip and elbow disease, and so on. In the struts child bones and joints are specially liable to inflammation.

Excision affords the only chance of recovery in certain advanced cases. Statistics are not satisfactory, but this should not influence the surgeon whose patient's condition demands the adoption of heroic measures. Each case must be treated on its merits, and no array of figures as to the results of excision should influence the question; for joints may have been excised which might have been treated less rigorously, whilst others are left uninterfered with until the child is past all surgery. The truth lies somewhere between these extremes.

When the local and constitutional disturbance of a suppurating joint is becoming greater than the child can bear, excision may bring immediate relief, the temperature falling straightway and convalescence setting in.

On the other hand, a child whom one has long watched becoming daily feebler from exhausting discharge, suddenly takes a turn for the better without special interference, and convalescence is established and eventually completed. (In such a case the cure would be by syntonoids.) These happy instances are not of frequent occurrence, but they are met with, and occasionally in three most recent circumstances when the surgeon has committed himself to positive statement that no treatment short of excision can

* Transactions of Clinical Society, 1881.

avail in saving the child's life (page 124). It is never advisable to make *ex post facto* a prognosis; it may be that on the child being removed from the care of the surgeon an abscess bursts, or a sequestrum is cast off, or some tubercular infiltration in bone undergoes caseation; and perfect rest being still maintained, and drainage provided for, under the beneficial influence of change of air and scene the unexpected improvement is inaugurated.

Alvuminaria, and the presence of a large, hard liver, should be taken as a suggestion rather than as a contra-indication for operation; it may become quiescent, or even disappear, if the great articular trouble can be afforded relief.

Excision is demanded also when the pus is finding its easy way into the pelvis through an ulceration in the depth of the acetabulum, as made out by digital examination through the rectum. Incipient phthisis is no contra-indication to the operation; indeed, the removal of a source of constant exhaustion (such as a diseased head of femur) may afford the child the only chance of triumphing over the lung disease.

When the patient is losing appetite, flesh, and vigour; when he is becoming pale or hectic; when his temperature chart is daily marked with lengthy ups and downs, or when bed-sores are appearing, something may have to be done. But simply because he is desperately ill, one should not stand by and refuse that chance of recovery, remote though it may seem to be, which excision may hold out. At least the operation ensures a free escape for discharge, and renders the socket accessible to anæsthetic irrigation. I have sometimes been astonished at the way children have picked up after the operation; but, on the other hand, it often proves more than the already exhausted system can bear up against; but even then the fatal end has merely been advanced a little.

The **operation** should be conducted with as little cutting as possible, old sinuses being used wherever they may serve. Bleeding vessels should be secured with pressure forceps as quickly as they appear, and tendinous insertions should be detached with the raspatoiry, or with but slight aid from the knife. The head of the bone, and the trochanter, may generally be detached by cutting forceps.

If necessary, the acetabulum may be gouged out. A large-sized drainage tube should be passed through the most depending part of the cavity so that the wound may be kept sweet. When acetabular disease exists, gouging will be required, sequestra being picked out; other small sequestra will be shed in due course. A few wire sutures may be required at the ends of the skin incision. The cavity should be stuffed with strips of lint which have been dipped in sanitas oil or sprinkled with iodoform, and a thick pad of salicylic wool and marine lint should be bandaged round the hip for the sake of compression. The limb may be fixed at rest by a stirrup and weight; it is better not to apply a splint. A little opium and some wine may be required.

Next day the wound must be dressed under an anæsthetic, and much less stuffing left in the cavity. An excellent antiseptic lotion will be the iodine water decolorised by carbolic acid. Carbolic lotion should not be used too freely, as children often show great intolerance for it. Poultices should not be used. The compression should be readjusted and the dressings attended to as circumstances may suggest. Quinine and iron will be indicated, and as soon as possible the patient should be got on to the balcony or out of doors.

If, from the confinement to bed, the skin over the trochanter get sore, the child may be kept for most of the day on his face, the bed being arranged so that he may

see what is going on in the room. If the case succeed the boy will eventually be going about as depicted on page 418, the joint becoming firmly ankylosed. No attempt should be made at keeping up movement of the joint.

In our case of resection for tubercular disease of the femur a strange condition was met with. The interior of the head and neck came away as soft as fresh mortar, leaving the articular layer of the head, and the incrustation cartilage, securely lodged in the acetabulum. The simulation of acetabular disease was perfect, and it was only at the post-mortem examination that it was discovered that the acetabulum was unaffected.

If, after the excision, the wound continue to discharge profusely and the child do not emerge from the retrogressive course; if the albuminuria persist and appetite fail, whilst the shaft of the femur becomes swollen and tender, a still further chance may be afforded in amputation of the thigh according to the excellent method of Furness Jordan.

Furness Jordan's amputation promises to be as important a measure in connection with the hip as Syme's amputation is with the foot. The risk of hæmorrhage is diminished to the utmost, the need ofortic compression, or leverage by the rectum, being entirely put on one side. Briefly, it consists in making an incision down on to the femur, from above the great trochanter to the middle of the thigh. With the periosteum raspatory and the sparing use of a scalpel, the femur is laid bare and disarticulated, the upper end being brought out of the wound by abstraction of the knee. All bleeding vessels are now secured with tenipressure forceps, a dozen pairs of which should be at hand. The assistant firmly grasps the shaft of soft parts which then form the upper piece of the thigh, and they are then cut through at about

the junction of the upper and middle third. The main vessels are relatively secured.

The operation is simple; it entails comparatively little shock; it leaves a long stump, and seems to answer every requirement. In the cases in which I have performed it, it has more than fulfilled my highest expectations.

CHAPTER XXX.

DISEASE OF THE SACRO-ILIAC JOINT.

SACRO-ILIAC disease comes on insidiously after a fall or other injury, especially in the unhealthy or strumous subject. In some cases there may be nothing to account for the onset of the trouble. Though it may be a primary affection, it is often secondary to disease of the vertebrae, or intercostals, or pelvis, but in any case it is a rare affection.

Symptoms.—The child complains of feeling tired after exercise, and of his back aching. He walks with caution, so as not to jar the diseased articulation, and he does not care to run or stand about; he will not dare to jump. There is also a feeling of "weakness" about the back. The pain may be constant if the disease be advanced, and at all times a rough, a shake of the bed, or a stumble, greatly intensifies it. The pain being confined to the bottom of the back is an important point as regards the differentiation from disease of the spine and of the hip. In disease of the spine the pains are referred to the area of distribution of the nerves whose trunks pass by the carious region of the column (page 239); in disease of the hip joint the first pains are in the knee or thigh (page 407). If, however, the trunk of the iliac nerve happens

to give a branch to the diseased sacro-iliaic joint, there might be complaints of pain down the limb as in hip-joint disease. As in hip-joint disease, also, the limb is wasted; but on squaring the pelvis no alteration in the length of the limbs is found. The limb assumes no characteristic position, but most probably lies extended.

Further points in the differentiation from spinal disease will be the absence of symmetrical pains in the thighs and legs (page 241), the absence of stiffness, straightness, or deformity (page 239) in the lumbar region. But the great feature in sacro-iliaic disease is the pain on pressure over the neighbourhood of the posterior iliac spines, and possibly a puffiness of that region.

The differential diagnosis from hip joint disease may be effected with certainty by flexing the thigh upon the abdomen and gently rotating the head of the femur in the acetabulum; also by gently abducting and at the same time exerting the extended limb. No child with hip joint disease would be able to submit to such examination. (See page 402.) But when the sacro-iliaic disease has been caused by spinal curvæ the diagnosis may be obscured. Pains about the knee, it may be remarked, may be secondary to disease of spinal column, sacro-iliaic joint, pelvis, hip, or of the knee itself.

On pressing the iliac crests together with the palms of the hands, or on cutively thrusting them asunder by grasping the anterior iliac spines between the fingers and thumbs, the disturbance at the articulation of the iliac crest with the os pubis elicits complaints. Striking the heel or the great trochanter would cause pain, but as pain would also result were the case one of hip or spine disease, this rough method of diagnosis is useless. By tracing the iliac crest backwards, and following it to the neighbourhood

of the posterior iliac spine the finger detects a spot where pressure causes deep-seated pain.

In the more advanced stage of the disease there is sometimes a localised puffy swelling at that part, and in time the skin over it becomes discoloured, and eventually yields to the pressure of increasing abscess. Nothing is gained by probing the joint when the abscess is opened.

A typically strumous boy is now under treatment for advanced sacro-iliac disease; a point of interest in his case is that he showed but little lameness at the onset of his trouble. In due course abscess formed, for which repeated aspiration failed to give permanent relief; it was then incised and drained. The general health is suffering, and it would not be surprising if the poor child fell a victim to tubercular disease, pyæmia, or metastatic abscesses.

Treatment.—The child should be put to bed and kept there in the horizontal position; he must not be allowed to sit up, as that attitude disturbs the relative position of the sacrum and ilium. Thus the confinement is more strict than it might be for either disease of the spine or of the hip joint. If the weather be fine and warm, he may be carried out into the open air, if this can be done without disturbance of his position. With rest in bed neuralgic pains will probably pass away; but should they persist, a few leeches might be applied over the tender spot, and the patient be subsequently kept lying on his face. Possibly a belladonna plaster, or some form of counter-irritant might be found of service. For chronic joint pains a touch or two with the thermo-cautery may afford relief. I doubt if much is gained by enclosing the pelvis in a stiff bandage whilst the child is being kept in bed, for there is practically no movement permitted at the joint, whilst the material used cannot but get in the way and render the horizontal posture

less pleasant. Analeis (page 414) and a stirrup may be useful in teaching a refractory patient the necessity of absolute quiet.

If after a certain amount of this treatment the progress of the disease be apparently arrested, and the patient be deemed sufficiently trustworthy for the purpose, he may be fitted with a Thomas's hip splint, and allowed to get about on crutches, as shown in Fig. 27. When not on crutches, however, he should be kept lying flat on a couch or hearth-rug, and any return of neuralgic pain should be taken as an indication that he should be put back to bed. To stave off suppuration is the great aim of the treatment. But if pus be detected it should be removed, as it is apt to find its way through into the interior of the pelvis, or into the rectum, the ischio-rectal fossa, or the thigh. If for this purpose aspirations fail, a free opening should be made, and the abscess dealt with on such principles as those enunciated on page 255.

The drugs will comprise cod liver oil, iron, quinine, and possibly small doses of opium.

Prognosis is always grave if abscess supervene; but if the child's health be good, and absolute rest in bed have been secured early in the course of the disease, the trouble may pass quietly and completely away. This happy result has been recently obtained in a case under treatment. But if abscess have formed, recovery can take place on the occurrence of ankylosis. Probably most ankylosis contain a preparation of firm synostosis of the os innominatum and sacrum, the result of disease. Ankylosis of the joint scarcely, if at all, interferes with its subsequent usefulness. If abscess form, and continue to discharge, the child's health becomes undermined, and death is apt to follow from exhaustion, pneumonia, phthisis, metastatic abscess, or even from waxy degeneration of the kidneys and liver.

CHAPTER XXXI.

DISEASE OF THE KNEE JOINT.

THE bones entering into the formation of the knee joint are the femur, tibia, and patella. The synovial membrane which lubricates the surfaces is large, and much exposed to injury; and being but little protected from the influences of cold and wet, it is particularly liable to suffer from inflammatory affections.

Whatever may be the eventual course and termination of the joint disease, it commences, as a rule, in the synovial membrane; it is fortunate, indeed, if it extend no farther.

Acute synovitis is frequently met with after a fall, or a wrench of the fibrous capsule, or after exposure to wet or cold. It may come on with extreme rapidity, the effusion of thin synovia into the articulation causing a peculiar elastic and fluctuating feel. The patella may be pushed forwards from off the trochlear surface of the femur. The distended capsule and the thickened membrane cause a fulness on each side of the patella, and on each side of the upper part of its ligament; there is also a great fulness, extending up for some distance under the quadriceps extensor. The depressions which are usually found at the knee are obliterated; now this last is a delicate diagnostic sign, for it is often manifest before effusion into the joint can be detected by palpation.

The partially flexed position of the knee gives the greatest room in the articulation, and it is invariably assumed. For the convenient maintenance of this position the limb is usually found lying supported along its outer side. The joint cannot be fully extended.

Every movement from this easy position, especially that of slight extension, increases the intra-articular tension, and causes pain. Pressure with the finger also causes pain, the most tender spot being immediately below the internal condyle of the femur, as there the finger may be brought most nearly in contact with the swollen membrane and the filling joint. The skin over the joint is red and hot, and the general constitutional disturbance may be considerable, the child being sick and feverish; he might even be attacked with convulsions. He would walk with a limp, and would be easily tired; when standing he would support all his weight upon the opposite limb; and, the damaged knee being slightly bent, the toe of that side would greatly touch the ground.

Atrophy of the thigh and leg quickly supervenes, and the joint becomes permanently fixed. In estimating the amount of the muscular wasting in the case of a fat child, absolute measurement with a tape may give little or no tangible result. A better way of appreciating the flabby and wasted condition is by encircling the leg in the first group of the finger and thumb, and carefully noting by how much the tips of those digits fail to meet, or overlap, and then comparing with the other side. (This style of measurement serves well also for the upper extremity.)

Acute inflammation may extend from the synovial membrane to the other articular structures, but often it is confined to the tissue in which it takes origin. If in this stage one could take a peep at the membrane, it would be seen pink from capillary engorgement, thickened from oedema, and bulging in swollen fringes in the lines of least resistance. The synovial fluid would be increased in quantity, thin and turbid, and perhaps flaky, or tinged with blood.

The **treatment** should be prompt and decided; the child must be put to bed, and absolute rest

secured for the limb. Two or three leeches about the joint may give great relief, and an even pressure may be resorted to. This last may be accomplished by moulded mill-board splints, or by lateral splints of plates of Paris, applied over a layer of wool; or the limb and knee may be evenly surrounded by a soft roller of doanette or flannel. In any case a splint should be applied long enough to reach from near the ankle to the upper part of the thigh; splinting merely the knee region does not at all suffice to secure steadiness. The limb should be brought as straight as possible, and raised on a pillow.

If the intra-articular pressure and pain be great, careful aspiration may be resorted to before compression is applied. Neither lotions nor fomentations can supply such valuable and permanent relief as even compression. A few drops of tincture of opium may be given every hour till the pain is eased, the effect of the drug being carefully watched; the administration of a full dose of castor-oil or grey powder may be advisable at the onset of the attack.

After all articular trouble has apparently passed away, the limb must for some time longer be kept at rest, and the patient under supervision. To give free play to the joint which has only just become convalescent, is to invite the invasion of chronic disease.

Acute suppuration sometimes follows in the course of the synovial inflammation, the neighbourhood of the joint becoming greatly swollen, and more red and edematous, the intra-articular effusion being at times obscured by cellulitis. The least movement of the leg is attended with exquisite pain; sleep and appetite have deserted the patient, leaving him in a condition of great constitutional excitement, and even peril. In these critical cases two points have to be cleared up: Is there certainly abscess? and, if so, is the pus inside or outside the joint? The first

question is answered by thrusting a fine aspirator needle into the depth of the swollen mass, when, if only slightly tensed fluid be withdrawn, the tension may thus be set at rest, and, under the influence of the treatment advised above, local and general quiet may be re-established. During this examination the child should be under the influence of an anæsthetic.

If the **abscess** be **extra-articular** the swelling and fulness will not be evenly distributed around the patella, as it would if the joint cavity were implicated, and the patella itself may be partially or completely elevated; it would not be floating. Moreover, the joint may be moved without alarm, provided the examination be conducted so as not rudely to interfere with the sensory nerves of the inflamed area.

Whether inside or outside the joint, the abscess must be freely opened, and that of *course*, for if outside the joint, the pus may quickly make its way into the interior.

The use of the scalpel should be limited, the way being cleared by the director and dressing forceps; everything should be scrupulously clean, even the fingers of the nurse or dresser. The abscess cavity should then be completely emptied by gentle pressure, and its cavity thoroughly washed out with a solution of decolorised iodine, or some other trustworthy antiseptic. If the pus be found in the joint, two short large drainage tubes should be passed into each side of the joint. Any bleeding vessel in the skin wound should be secured. Then the limb must be fixed in absolute rest, the joint having been firmly surrounded with a thick packing of eucalyptic wool and carbolic tow.

Or the joint may be treated throughout on the Listerian method, which imperatively commands the carrying out of the great principles just enumerated, *viz.* thorough evacuation, washing, and drainage, and

undisturbed rest and cleanliness. Food must be given lest the child suffer from the effects of *carbolic acid poisoning*, the signs of which are drowsiness, depression, sickness, collapse, and a low temperature, the urine being olive-green or dusky.

The **prognosis** must be considered as affecting the loss of the joint, of the limb, of the life. The best result that can be generally expected is *free bony ankylosis*, and with this object in view the limb should be kept in absolute rest in the extended position for week after week. As the amount of the discharge diminishes, the drainage tube may be of smaller calibre, and at last a strand or two of horse-hair or silk may suffice to ensure freedom for discharge. All this time irrigation of the joint with an antiseptic fluid must be observed. If there should be a second abscess in the upper pouch of the synovial membrane, it must be freely opened, washed, and drained. Care must be taken against the occurrence of pressure sores along the back of the limb, the heel, and the pelvis. Iron and quinine, and two or three ounces of wine, will be the chief medicines needed; opium will be found of value.

Though ankylosis will be the best result that can be reasonably expected after the formation of intra-articular knee abscess, still, if the suppuration have not involved the destruction of the cartilages and ligaments, recovery may take place with a freely movable joint. I have had several such results; three of the subjects of them were exhibited at a meeting of the Medical Society of London.* To secure such happy termination it will be necessary to open the abscess as soon as it is diagnosed, to let the openings be free, to see that the washings are carried out with thoroughness, and that the general supervision of the case is close and constant.

* The *Lancet*, Feb. 12th, 1882.

Supposing that the child survives the bursting of the abscess or treatment by incision, but the joint continues to discharge such a large and increasing amount of pus that the child seems likely to sink under the constant drain; and that the skin and, as far as can be determined, the other tissues about the joint appear unhealthy, and all hope of obtaining even ankylosis of the joint has been given up, what line of treatment shall be adopted, excision or amputation? This important matter will be considered after dealing with the following subject (page 445).

CHRONIC SYNOVITIS, PELLET DISSEMINATION, OR SPRUMOUS DISEASE.

Pathology.—The morbid change generally begins in the synovial membrane, which is converted into an indurated and thickened pulpy mass. In places it is pinkish grey, but throughout it is adenomatous and soft, and resembles unhealthy granulation tissue. It bulges evenly, and forms a mass of padding by the side of the patella and its ligament, and under the lower part of the quadriceps extensor of the thigh. Sometimes it gives the sensation of there being fluid in the joint, but no definite wave of fluctuation can be transmitted from side to side beneath the patella. Wandering corpuscles infiltrate its substance, whence they escape into the serous, cloudy fluid which represents the synovia, and excite degenerative changes in the adjoining ligaments and cartilage.

Thus, the ligaments give way and the articular cartilage is softened and eventually disappears, and the bone becomes carious. Abscess may form in the substance of the swollen mass or in the interior of the joint, or even, though less frequently, outside it.

Destructive changes may extend to the skin, which by this time has become red and tender; and an ulceration which has quietly formed will allow of

the escape of unhealthy pus, and also of an extension upwards of a fungating mass of granulation tissue, which is now the sole representative of the softer elements of the joint.

The **cause** of the disease is likely to have been wet or cold, or some such injury as a sprain or blow. It may run its course even in a comparatively healthy child, unless rest for the joint, and other conditions, be secured. The more unhealthy the child the greater the probability of eventual destruction, whilst the joint of the typically "strumous" subject is, of course, most speedily disorganised. What the association may be between strumous synovitis and the presence of bacilli in the swollen tissue cannot at present be definitely stated; possibly it is but accidental. It is a suggestive fact that members of the family of the child with chronic joint disease are liable to phthisis and other forms of tubercular disease.

Symptoms.—Attention may first be called to the joint on account of the child limping, and though he may have complained of nothing more than an occasional aching after exercise, or of the knee feeling "hot" at night, a careful examination may show the part swollen and the muscles already wasted.

If the child continue to limp about, the joint becomes more swollen and flexed; and the globular or ovoid mass of the knee looks still larger on account of the muscular wasting; still the bones are not enlarged.

There is no true fluctuation in the joint, the swelling being due to oedema of the synovial membrane. The skin is thin, pale, and shining, and marked with turgid veins, the general appearance justifying the epithet of **white swelling**.

As the disease advances, the pain becomes increased, and the least movement or shake causes intense distress. The child is awake from sleep by restless and painful startings. These startings may

suggest the occurrence of ulceration of the cartilage, but they may occur previous to any definite lesion of that tissue.

The **deformity** of the knee is due not only to the thickening of the synovial membrane, but also to a characteristic displacement of the tibia upon the femoral condyles. The head of the tibia is drawn backwards (flexion) to relax to the utmost the lateral ligaments, which are placed well behind the axis of the joint. Later on, the muscles which steady the joint in this easy position undergo permanent shortening, and the head of the tibia is brought to the very back of the condyles.

As the ligaments soften and yield, and as for ease and comfort the limb is resting constantly upon its outer side, the head of the tibia, from the mere weight of the leg, drops to the outer side, whilst the weight of the overted foot determines at the same time an outward rotation of the leg. Thus the head of the tibia is displaced backwards and outwards and rotated outwards. This deformity goes on increasing until the internal condyle of the femur projects beneath the skin like a morbid outgrowth.

Either with or without the occurrence of *ulcer* the joint may become ankylosed in this position, the limb being left useful though seriously deformed. The gait of such a patient may be greatly improved by a thick boot, but it is advisable not to supply this boot too soon, lest compensatory tilting of the pelvis be introduced with.

No attempt to forcibly straighten out the ankylosed knee should be undertaken; nor, unless the deformity be extreme, should excision be advised. If there be enough movement to show that there is no synostosis, an attempt may be made to straighten the limb gradually by Thomas's splint. To leave well alone, is an adage peculiarly applicable to slight

deformity left after the clearing up of old-standing articular trouble. With care and patience, even



FIG. 79.—Deformity of Left Knee. FIG. 80.—Thomas's Splint for Knee or Ankle. Fattier raising sound side.

extremely unpromising cases of deformity may be straightened out by the splint (Fig. 80).

The **treatment** will consist in obtaining absolute rest; if the child be young or untrustworthy he should be secured in his cot, the thigh and leg being encased in a rigid splinting which will reach almost from buttock to ankle. This may be made

of undressed leather softened and moulded on to the sides of the straightened limb, and secured by straps; or plaster of Paris may be used as in a Bavarian splint.

If a child be old enough he may be fitted with a Thomas's knee splint (Fig. 80) and allowed to walk about as depicted in Fig. 72. Though no child is too young for these splints, still it is only the trustworthy child that can be allowed the use of crutches. If there be great displacement of the tibia, the use of Thomas's splint will be indispensable.

This apparatus is of infinite service in the treatment of all forms of knee joint disease, either with or without suppuration, where permanent rest and correction of deformity are sought. It consists of an oval iron ring of $\frac{3}{4}$ in. iron, padded, and covered with leather. It is welded obliquely upon the upper ends of two parallel iron rods which are long enough to reach several inches below the sole of the foot, where they are connected with an oval pattern. A leather apron is stretched across the bars to support the back of the limb. The lower and more thickly-padded part of the upper ring lies against the perineum, and is kept in its place by a brace passing over the shoulder of the sound side. The limb is bandaged into the trough of the splint by a wide flannel roller, but the leg is not to be so firmly bandaged to the splint as the thigh will be, so that, as the limb yields to the pressure, the foot may descend. As so often happens when any other form of splint is being used, the limb cannot twist round and escape the gently straightening pressure. During the treatment friction is avoided, and the child, if old enough, can walk about all the time that the cure is advancing, without fear of hurting the knee.

The method of treatment by **weight and pulley** is not nearly so satisfactory as this either in bringing

the knee straight or in completing convalescence; and whilst the cure is being wrought the boy has to be kept in bed.

With the intelligent use of Thomas's knee splint persistently carried out until all pain has disappeared, either from perfect recovery or ankylosis having occurred, excision will be less frequently required. The force thus applied is altogether different in its effect from energetic straightening under chloroform, the result of which is often to shift the tibia farther back upon the femoral condyles as the posterior ligament and other resisting media are tightened up under the strain.

The value of Scott's dressing of camphorated mercurial ointment probably depends upon the combined effects of compression and rest. With the use of the iron splint, external applications will be rarely needed. Cod liver oil or quinine and steel may be prescribed.

Prognosis.—Under prolonged treatment the joint may clear up completely; or the disease may end in ankylosis in a favourable position. If matters do not go well the case may ultimately demand excision or amputation.

The question of **excision or amputation** is one of great importance, and although the surgeon may have it constantly before him in the treatment of a case that is not answering to the remedies employed, still he must always approach it with deliberation. And when it is evident that the adoption of one or other of these heroic measures is necessary to save the child's life, he should be guarded in the manner in which he communicates the fact to the parents. He must lay the case before those whose duty it is to decide what, if any, new course should be taken. Though a parent might not hesitate to give consent to the removal of his own limb, he will sometimes decline to allow the adoption of a similar course with respect

to his child. He shrinks from the prospect (as quoted by Holmes) of his child "watering life drained."

The surgeon should be guarded in expressing his opinion, however strongly he may hold it, that unless he obtains the consent which he asks the child will surely die. It has happened to me, as, doubtless, to other surgeons, that in thus definitely demanding the sacrifice of the joint or the limb, the parents have removed the child from hospital, and watched his happy convalescence at home. Possibly the case was just about to mend at the time of its being taken from hospital, or it may be that the change of air should have the credit of the improvement; but the awkward fact remained, that after the treatment urged by the surgeon in measured words has been declined, the joint began to mend.

It is but natural that the profession and the public take different views of the question. The profession may be right in urging operation in the strongest terms, for experience has shown that nine out of ten such knees, if left uninterfered with, would end fatally. The most judicious course, therefore, for the surgeon to adopt is to lay the case clearly before the parents, explaining the risks and the alternatives, advising from opinions founded on broad principles; urging operation, but never commanding it. The surgical art cannot yet claim infallibility.

Amputation.—If the child be rapidly going down hill, be losing appetite, growing restless, maintaining a high temperature in the evening, and a constant morning fall; if the joint ends of the bones themselves have become thickened from disease, or the surrounding tissues grievously infiltrated with matter or riddled with sinuses; if the urine be albuminous, the liver large and hard from amyloid degeneration; or if moist rales be heard over part of a lung, or the presence of disease in that tissue be rendered evident by

occasional attack of hæmoptysis; or if the occurrence of severe discharges threaten a fatal issue, the propriety of amputation at the lower third of the thigh is unmistakable.

The question as to when excision can be performed, instead of recourse being had to the more serious mutilation, is difficult to answer. Briefly, one may say that excision is an operation which will entail much more demand upon the already flagging constitution than amputation would, whilst convalescence, rapid as it might be, would be inevitably prolonged. Mr. Halsey puts it very happily when he remarks that every month after an excision advances the cure only as far as a week would after amputation. A solid union between the saw surfaces of bone is a matter of many months, and no result short of synostosis can be considered satisfactory.

Probably the surgeon who is an advocate for excision in the early months of knee disease, will show better results as regards the operation than would another who did not operate until the local and general conditions indicated that the only alternative would be amputation. But such statistics as the former practitioner might adduce would be entirely misleading.

A great deal may be done by ensuring a free escape for discharge. If this source of irritation be removed, and the parts kept at rest, what is there to hinder the supervention of ankylosis? Much of the value of exploration and of the so-called "partial operation" depends upon the assurance of free escape for discharge.

As to treatment by the application of sulphuric acid, which is introduced on strips of lint into the well-cleaned joint, by free lateral incisions, the essential part of it may consist in the free incisions which it necessitates, and the subsequent rest, rather than in the therapeutic influence of the acid.

Free incision into the joint, with scraping of the diseased tissue, is a far less serious measure than excision; and in cases in which the extent of the disease is limited, it may give an excellent result. (See also page 473.)

If the operation of excision be determined upon, the child should be got into the best state of health possible. There is, as a rule, no immediate hurry, so that some weeks at least may be spent in improving the general and local condition of a child who has recently come under treatment. Possibly the adoption of such measures may obviate the necessity for the contemplated measure.

Excision.—If the disease have been running a long, intractable course, and have made, after many weeks or months of careful supervision, no real improvement; if the bones do not appear too extensively diseased, or their shafts expanded; and if the patient be the subject neither of marked struma nor exhaustion, and the lungs be sound, and the urine contain no albumen, excision may fairly be undertaken. But cases upon which an extremely unfavourable prognosis has been expressed, may recover without operation (page 444); of this fact the surgeon should never lose sight.

The **operation** should not be precipitate; every preparation should have been made in advance. The bowels should be well open in the morning, so that there may be no disturbance after the operation. The splints should have been carefully planned, padded, and covered, and the limb well washed with soap and water and an antiseptic fluid. The instruments should be at hand, and the assistants informed of their respective duties. Chloroform having been administered, a semicircular flap is made by an incision which starts from the lateral swelling (tuberosity) of one femoral condyle down to the tibial tubercle, and up again

to the tuberosity of the other condyle. The horns of this incision should reach well back, so as to be available for subsequent drainage; the knife should pass right down to the bone. Bleeding vessels will then be secured. It is better not to operate with the assistance of Romzek's hand, as the bleeding is always troublesome after the compression has been removed. There should be no hurry over the operation; each bleeding point should be attended to before the next step is taken. The crescentic flap of skin and subcutaneous tissue is boldly dissected up from the front of the patella, and the joint opened by passing the knife across the top of that bone, and down each side of it and its ligament, the ligament itself being severed at its lower attachment. The patella can be of no use to the ankylosed knee, and if left there is a chance of its cartilage becoming the seat of further degenerative changes.

The knee is then flexed, and the lateral and crucial ligaments divided. The former are best attacked just below the level of the femoral tuberosities. The articular surface of the femur is cut off by a broad oblong saw, which is directed straight down to the head of the tibia. If the joint be partially ankylosed, force may be required in detaching the patella and flexing the joint, but when the joint is flexed the section of the femur can be effected, as described above, without risk of wounding the popliteal artery.

The layer of cartilage between the shaft and epiphysis of the femur should not be damaged; on the integrity of this layer the subsequent growth of the thigh bone depends. So also with the upper epiphysis of the tibia; the epiphysis which is last to join is that most concerned in the lengthening of the bone.

A great advantage of the wide-bladed saw is that it may be used as a lever to complete the separation of the condylar mass, instead of its being sawn through.

Butcher's bow saw should be used only when the bone is to be cut from behind forwards; that is, indeed, its only advantage; it should not be used as an oblique saw. If the oblique saw have not a shifting back its blade must be deep enough to complete the section without its back checking its career. The chain saw should not be used; its linked recesses are apt to contain septic matter. As the femur is being sawn the thigh and leg must be firmly held by the assistant; next, the articular surface of the head of the tibia is to be sliced off. The surgeon then looks if he have two evenly cut and healthy surfaces which will come flat together without much strain to the tissues behind the knee. If the strain prove excessive, another thin slice of bone may be removed, or some of the hamstring tendons divided. If after the section the condition of the bone appear unsatisfactory, the gouge may perhaps be used with advantage.

When about to excise, the surgeon must have all matters arranged so that he may anticipate if, as he proceeds, he consider the adoption of that course expedient. Any small osteal ulcers or abscesses met with in the course of the excision must be scraped, and all granulation tissue and degenerate synovial membrane removed. It is believed by some that this tissue is impregnated with infective and devastating bacilli.

When all bleeding has ceased, but not until then, the sawn surfaces are to be permanently adjusted, and the limb steadily held whilst being bandaged on a back splint with a foot piece. This splint should reach up to the fold of the buttock, its padding being protected by waterproof tissue at the back of the knee. As it is not to be taken off for several weeks, it may be secured with firm strapping or plaster of Paris rollers. Care must be taken that the heel does not press upon the pad. Wire sutures should be inserted and the wound dried.

The extremities of the wound may be left gaping, a suture or tubular drainage being inserted if considered advisable. The knee is then packed around with iodoform or sublimate wool, and a splint, long enough to reach from the axilla to the foot, secured along the outer side of the limb and trunk. This, as advised by Gant, has an excellent steadying effect upon the knee. This first dressing is applied before the patient is taken from the table. If the outside splint be arranged with a bracket, less disturbance of the apparatus will be needed at the subsequent dressings. The dressing requires changing next day, or the next day but one, the child being under an anæsthetic. The outside splint will be removed, but the back splint should not be disturbed. If the carbolic spray and dressings be used, the condition of the patient and of the urine must be watched against the occurrence of the toxic effect of the acid. Care must be paid to absolute cleanliness; not a mere dipping of the fingers in carbolic lotion should suffice.

If oozing of blood be troublesome, and delay the final steps of the procedure, the cut surfaces may be swabbed with a strong astringent and antiseptic solution, e.g. of chloride of zinc, of the strength of ten grains to the ounce.

Modifications in operating.—The method of excising the joint by making a vertical incision through the integuments at the front of the knee, sawing across the patellar, and reflecting its fragments upwards and downwards, does not appear to offer adequate advantage. Mr. Marsh adopts the plan of boldly peeling the tibia and femur together by two large knitting needles driven up through special skin wounds made below the tuberosities of the tibia.

Dr. Ferriek, of Montreal, shaves round the diseased femoral condyles with a fine fret-saw, and then slightly hollows out the head of the tibia with

the saw; thus, on the conclusion of the operation, the lower end of the femur rests in a kind of gloved cavity.

Mr. Davy incises the cut end of the femur into the head of the tibia.

Resection by lateral incisions affords the means of securing excellent drainage.

Appreciation.—If at four or six months after the excision the patient be walking about upon the limb, the case promises well. How much better a result than the amputation could have given! But, unfortunately, this is not the rule; in some the consolidation occupies many months, during which time the child may be suffering from the exhausting effects of discharge; but recovery may yet take place if the surroundings be favourable. In some cases the shock of the operation itself proves rapidly fatal; in others acute or chronic osteomyelitis, a complete failure at firm union, secondary abscesses, or irritative fever necessitate amputation or cause death. In some cases a partial success is obtained, and a subsequent laying open of small abscesses or a partial or complete resection may at last accomplish perfect consolidation.

The interference of albuminuria, tubercular deposit in the lung, or hæmoptysis, may call for immediate sacrifice of the limb. Sometimes an excision goes on well for weeks or months, and then a degenerative process supervenes which may entail amputation.

In the best results there will be considerable permanent shortening of the limb, but this apparently diminishes as that side of the pelvis drops.

The statistics of excision cannot be compared with those of amputation in the treatment of old knee joint disease; the latter show a far higher percentage of recoveries. The comparison is manifestly

undue, as the very worst cases are relegated to amputation, whilst the more promising ones are submitted to excision. Bryant goes so far as to say* that excision is nearly seven times as fatal as amputation during young life. He remarks that if excision be undertaken with a patient in good health, and not worn out by suppuration, a good result may fairly be looked for. He asks, if the risk is even then so slight as to justify the surgeon in throwing aside the hope, and perhaps a fair expectation, of securing a recovery with natural processes. This question is a pregnant one; and if the importance of thorough and early treatment were more generally recognised there would be less opportunity for heroic interference.

Ashurst remarks† that no operation should as a rule be advised in very young children, though even in these the surgeon may have to choose between excision and amputation when exhaustion is threatening from suppuration. Ashurst's table of twenty-six excisions gives three instances in which he excised the joint in children of five years of age; all recovered, two with a useful limb; of the third nothing is said as to the condition of the parts after the operation. Four children of six years were operated on; one died from septic pneumonia, and one from double pneumonia, whilst the others had useful limbs.

For our London children, when suppuration is threatening with death, the operation of excision can rarely commend itself, with its possible eight, ten, or twelve weary months of after-treatment. Amputation is the alternative. But with young children it is better to temporise, to patch up the joint until the patient reaches an age when operative interference can be adopted with a better prospect of success; the age of puberty, on the whole, gives the best

* "Practice of Surgery," p. 862. 2nd ed.

† "Encyclopedia of Surgery," vol. iv., p. 313.

results. Ashurst remarks that those cases which he has seen operated on at an earlier period than nine or ten years have usually done badly.

In a second table of cases of excision, which has been compiled from Cuthbertson's figures, it is shown that of thirteen children who were operated on under five years of age, seven died. In children between five and ten years, of whom there were 106, the mortality was 16·2 per cent. But unless the 38, who are reckoned as recoveries, grew up with a sound and useful limb (a difficult matter to determine) the figures can only be approximate. One always feels one would like to get behind statistics and take a leisurely review of them.

As regards dressings, Ashurst knows of no better application than olive oil; it should be covered with oil-silk so that the parts may be left moist and undisturbed for forty-eight hours. By this method he has obtained better results than those shown by Ollier with strict Listerism.*

If, though the case do fairly well after operation, a chronic discharge continues from a sinus which is evidently leading down to ulcerated bone, excellent effect may be derived from sending the child into the country or to the sea side. But if this fail to establish health, the wound may be enlarged and the bone explored and scraped. If this be unsuccessful it becomes a question as to whether a secondary excision be performed or amputation resorted to. The former line of treatment should be undertaken only if the general health be satisfactory, and, judging from the result gained by the previous operation, if still further improvement seemed likely to be obtainable. If the child were losing ground, amputation would be demanded.

Evenden remarks that in very early childhood

* *Lancet*, p. 522.

excision is seldom necessary; the natural process usually sufficing, with assistance, to eliminate diseased bone, and the disorganised joints settling readily enough of ankylosis. If the disease be too severe for natural repair, healthy reparative action is little likely to follow excision.

Though **amputation of the thigh** for knee joint disease should be resorted to only in extreme circumstances, it is a highly satisfactory measure as regards the rapidity of convalescence. A child in the last stage of exostosis from knee joint disease may a few days after amputation be sitting up in bed playing with toys and enjoying his meals.

Amputation of the thigh is performed under chloroform, no matter how weak and emaciated the child may be. The thigh should be thoroughly cleansed, and washed over with a warm solution of carbolic acid, 1 in 40.

In many of these poor children the limbs are covered with long silky hairs; these had better be shaved off, as they adhere to the dressings. This hairiness is generally associated with constitutional weakness. The limb may be simply raised to empty it of blood, and circulation controlled by the fingers of a colleague, or by a fat elastic band fastened round the limb just below the groin; but there must be no rough constriction of the wasted limb. The first flap is cut at the front of the thigh by a large scalpel, but not by transection; it should be longer than the posterior so as to fall eventually over the saw bone. It should consist of skin and subcutaneous tissue; nothing is gained by its containing any muscular tissue. The skin at the lower end of the flap should be healthy, but the presence of an old sinus or ulceration matters little, especially if the weak granulation tissue be subsequently scraped. The posterior flap should also be dissected. The flaps being held well out of the way,

a circular sweep is made with the knife down to the bone. An oblique saw is used.

The chief vessels are to be looked for and tied with fine catgut before the compression is relaxed; every bleeding point is to be secured; the loss of sponging the better. When bleeding has ceased, a drainage tube is to be laid across the depth of the wound and the edges secured by a continuous suture of fine wire deeply inserted. A few syringefuls of sublimate solution may be passed between the flaps. The dressings may be of wool-wool or dry lint, the limb being secured on a short splint. Opium will be required.

Next day, or next day but one, the dressings should be removed under chloroform, and the drainage tube replaced by a smaller one, the sutures being left, and dry dressings being again applied.

The second dressing will be required in about a week, or earlier if there be oozing. On the removal of this dressing the sutures may be removed, the wound being all but healed. Soon after the operation the child should be placed in the sunshine or open air. When the limb has become perfectly sound and free from pain, the child should, if old and strong enough, be trusted on crutches. An artificial limb should not be supplied for a year or two.

CHAPTER XXXII.

DISSEASE OF THE SHOULDER AND ELBOW JOINTS, ETC.

THE head of the humerus is held against the shallow glenoid cavity in the loose embrace of the capsular ligament. Thus practically every movement of the arm is unimpeded, and that fruitful source of joint

disease, speaks, is comparatively harmless. In addition, the scapula plays freely over the chest, so that violence is little likely to affect the joint.

A not uncommon cause of **traumatic synovitis** or arthritis is pulling or swinging a child by the arm. Pain is complained of at the shoulder, but as the joint is thickly covered by the deltoid, and no redness of the skin supervenes, the mother, seeing nothing arises, gives the matter no further heed. The boy meanwhile uses the arm as little as possible, he puts on his dress cautiously; with this rest the joint may recover, provided that the child be strong and healthy. If the surgeon were called in, as he should have been, he would probably have found the skin over the shoulder slightly warmer than on the other side, and the immediate region of the joint swollen, elastic, and tender. If he abducted the arm whilst the fingers were placed over the inferior angle of the scapula, he would have found that the scapula moved with the arm. This is evidence of a stiffness of the joint, probably the result of intra-articular effusion.

Treatment.—Complete rest must be enforced, and while the joint is painful the child should not be allowed to disturb it by passing his arm through the sleeve of his frock or shirt. In this way the arm is effectively rested, for he must wear it beneath his clothes. It had better be raised in a sling, and fixed to the side, and he should not have free use of it until all trouble and pain have disappeared. (For the means of confining the arm refer to page 380.)

Suppuration in the joint may supervene if the child be unhealthy, or if the violence which set up the synovitis were extreme.

Case.—A nurse girl swung an infant violently by the hand; immediately afterwards the left shoulder joint became painful, swollen, and tender. Any attempt to abduct the arm caused the shoulder blade to

move with it. The arm was fixed to the side. Anodyne mixture and poultice were prescribed. Three days later the infant was sleepless, and without appetite. There was evident tension in the joint, and the skin over the shoulder was red, possibly only from the poultice. Under anesthesia a fine tenotomy knife was passed through the deltoid and into the joint, and, pus escaping, the track was enlarged with the drawing forceps, a large abscess being evacuated. The cavity being washed out with iodine water, a small drain was inserted, the arm fixed to the chest, and the shoulder packed around with antiseptic dressings. Relief was immediate and permanent. When, two years later, the child was examined, the range of movements of the joint was found perfect; indeed, there was no evidence of the old articular disease except a small white scar, which indicated the site of the operation wound.

Suppuration in the shoulder joint demands early relief of tension. Unless the pus be afforded free escape, the joint may be completely destroyed. Such local and constitutional disturbance as that in the case just recorded must needs be associated with abscess. If in any case there be doubt as to the presence of pus, a grooved needle may be introduced into the joint. With scrupulous attention to cleanliness, and care in manipulation, no harm can follow from this.

Even with the early adoption of therapeutic measures the inflammation may advance, suppuration becoming abundant and continued. With perfect rest and drainage such a joint may still recover with little, if any, impairment. Or the inflammation may give place to a perfect synostosis. This last is not, however, a very serious drawback; its practice should be considered a happy termination of a grave condition. The scapula plays so freely upon the chest that the deficiency of the joint movements can be thus vicariously and ably performed. It is doubtful if a better

practical result could be obtained by excision than one sometimes sees in cases where ankylosis has supervened in childhood, and this should make one pause before subjecting the patient to a serious operative procedure. If the head of the bone be necrosed, there may be no option but to excise.

Possibly too much stress is laid upon the performance of a "subperiosteal operation" in excision. It is convenient to leave the periosteum when resecting the extremity of the humerus; but probably a greater power is ascribed to degenerate periosteum, in the matter of forming fresh articular buttresses, than it actually possesses. For **incision** see page 472.

For **epiphysitis**, see page 374.

Excision is rarely required; patient and prolonged supervision of the child, and perfect rest of the limb, may restore the joint, even after the occurrence of suppuration, and will generally suffice to establish a useful, though ankylosed, limb.

THE ELBOW JOINT.

Entering into the formation of the elbow joint are the humerus, the ulna, and the radius, their articular surfaces being enclosed in a capsular ligament, and lubricated by a single synovial membrane, one reflection of which descends into the superior radio-ulnar articulation, and lines the orbicular ligament.

Synovitis.—When inflammation attacks this membrane one of the first objective signs will be the partial effacement of the dimple in the skin, which should be found below the external condyle of the humerus when the elbow is extended. At the depths of this dimple are the head of the radius, and the most substantial part of the elbow joint. When synovitis is suspected, a careful comparison of the two elbows should be instituted, and first as regards this dimple. Swelling may also be found at the front and back of

the internal condyle; and later on, as the joint becomes more distended, a bulging may be detected on each side of and above the olecranon process, and even at the front of the elbow against the pronator radii teres.

Other signs of the inflammation will be the increased warmth of the surrounding skin; but in estimating this, due allowance must be made, perhaps, for the fact of this elbow having been carefully wrapped up, or the other arm being left exposed through a short-sleeved frock. Redness of the skin is not an early sign of inflammation within the joint unless the inflammation be excessive. Some stiffness there is certain to be; the child will not allow the fore-arm to be completely extended on the arm, because in this position the strongest part of the capsule is put on the stretch, and the intra-articular pressure thereby increased. As the synovitis increases, the whole neighbourhood of the joint will be enlarged, the fore-arm partially flexed, and more than half way pronated, and the skin will be red and hot; there will also be complaints of pain and tenderness, and of disturbed nights.

The **cause of the synovitis** may be, as in the case of the knee, wet, cold, or injury; delicate children will be the more likely to suffer from the effects of such exposure than the strong. The fashion of making little children wear low frocks and short sleeves, regardless of weather, is prejudicial. Synovitis is started by a sprain, a severe pull at the wrist, or by a fall upon the hand or elbow.

Treatment.—If the inflammation be slight, the limb should be bandaged from the hand upwards, and the elbow firmly compressed in mill-board splints, applied over a layer of cotton-wool. Or the elbow may be firmly bandaged and fixed to a light, flexible iron splint; the hand should be worn in a sling, or a plastic wrist may be modelled on as shown in Fig. 67. From the beginning of the treatment the elbow must be

fixed at a right angle, lest disease ensue, perchance, in ankylosis. The case of slight synovial effusion must be treated with precision from the earliest moment, otherwise chronic inflammation or destructive arthritis may supervene.

Absolute rest with firm compression are found excellent treatment; but if the inflammation be very acute two or three leeches may be applied. If lotions, liniments, or poultices have been just previously employed the skin must be thoroughly washed with soap and water, and sponged with milk, or the leeches may refuse to bite.

Abscess in the joint may follow if synovitis have been intense, if the patient be of feeble constitution, or the surroundings unsatisfactory. The coming of suppuration may be marked by a convulsion, increased feverishness, and restlessness. The skin may become thin and livid in the neighbourhood of one of the condyles, or along the outer border of the pronator radii teres, and fluctuation be evident.

If needed to confirm the diagnosis, chloroform may be administered and a grooved needle introduced; and, pus escaping, the abscess may be freely opened. The joint should then be gently squeezed between the fingers so as to empty it completely, and the cavity washed out with warm sublimate solution or iodine water. A small drain is to be introduced and the part surrounded with iodoform wool, the splint being reapplied.

Prognosis.—Cases of suppurative synovitis of the elbow may entirely recover, disturbance subsiding on the relief of tension; no more pus being formed, and the cartilages remaining uncomplicated. But if ulceration have already attacked the cartilages, and an inflammatory softening have invaded the ligaments, **suppurative arthritis** supervenes.

Pus continues to escape from the opening already

made, and a second, or even a third, aperture is devised. Secondary abscesses form above or below the joint, amongst the muscles, and even beneath the peritoneum; the bones become carious and softened, and small sequestra may escape. The limb becomes peculiarly thin; but though the elbow is greatly swollen there is but slight, if any, expansion of bones, the thickening being in the softer tissues of, and external to, the joint. From the intensity of the inflammation the epiphyses may be loosened or cast off.

The treatment of suppurative arthritis of the elbow, unless of a pyemic nature, is as a rule unsatisfactory. Thorough evacuation and drainage and rest must be provided for, the general health must be improved by the administration of quinine, iron, and cod-liver oil, and by judicious dieting. The cavity may be irrigated every day or two with warm antiseptic lotions. If in spite of judicious treatment suppuration increase, and the child's strength diminish, excision of the joint, or amputation, may be performed.

Excision of the Elbow Joint.

Excision gives marvellously good results in childhood. Though the limb above and below the joint be composed of apparently but skin and bone, while the region of the elbow is greatly swollen and filled with sinuses, excision may be tried even though amputation be eventually demanded.

If the child be the subject of advanced lung disease, and possibly of hæmoptysis, if the urine be loaded with albumen, or the health exhausted, amputation would be appropriate.

Children could be brought forward whose arms, both for appearance and usefulness, would bear testimony to the propriety of resorting to the excision even in extreme cases of articular disease.

The operation of excision.—Before the anæsthetic is administered the arm is to be thoroughly washed over with warm soap and water, and again with a weak antiseptic lotion just before the knife is used. The arm is drawn through a hole cut in a large piece of muslintomb sheeting, and the sheeting spread as a protection for the dress. There should be no unnecessary exposure of the body to cold.

With a short-bladed scalpel a long radial incision is made right down to the bone, and, passing over the salient angle of the well-bent elbow, down to the humerus, the olecranon process, and the upper end of the posterior border of the ulna. The thinner the arm, and the less swollen the elbow, the shorter may be this incision: perhaps three inches may suffice for its length. Any closure is or near the course of the incision should be made use of, but the knife should be kept well to the middle line. Nothing is gained by a deviation to the side of the olecranon process.

Esmarch's band should not be applied, on account of the troublesome swelling which takes place on its removal; all bleeding vessels should be secured as the operation progresses, and for this purpose forceps are of great value (Fig. 2).

A strong, blunt respiratory is used for separating the periosteum from the bone, and with it much of the muscular and ligamentous fibres; where necessary, fibrous connections may be touched with the knife. The less that the knife is used, and the more that the bones are cleared with the respiratory, the less is the bleeding.

The attachment of the triceps to the olecranon process will require the use of the knife, but the fibrous expansion from it to the deep fascia at the back of the fore arm must be jealously guarded; much of the future power of extension will depend upon its integrity. Bands of fibrous tissue should not be

needlessly divided, lest they contain important nerves or blood-vessels, or lest their severance should detract from the future strength of the false joint. The ulnar nerve should not be seen during the operation; it should be carefully raised in its bed of loose connective tissue between the internal condyle and the olecranon, and kept out of the way by a retractor, or slipped by the gentle leverage of the raspatory over the internal condyle.

Then, by forcibly bending the elbow, the end of the humerus may be made to project, and after a few touches with the knife or raspatory about the lateral and anterior aspects, the articular end may be cut off with sharp bone forceps. Only so much of the humerus as is condensed for removal should be bare of periosteum, lest exfoliation occur and ossification be retarded.

Then the ulna and radius should be cleared of attachments and cut off. Even if the head of the radius be not implicated in the disease it is better to strip it off, so as to avoid the risk of its articular cartilage undergoing subsequent ulceration.

Shreds of unhealthy tissue may be cut off with the scissors, and granulation tissue scraped away from synovial recesses and dead sinuses.

The cavity should be washed, and deliberate search made for bleeding points. It is then loosely packed with iodoform lint, the ends of the wound approximated with wire sutures, the dressings applied, and the fore-arm and arm enclosed in a soft bandage, with compression around the elbow. The solution of corrosive sublimate (1 in 1000) and dressings of wool-wool may be used. The arm should be laid upon a pillow.

When excision is performed for disease, the muscles are so wasted and feeble, and the limb so accustomed to lie quiet, that a splint is not needed; it would be different if the excision were performed

for a recent injury. The sooner that the arm is moved about the better, but movements need not be resorted to whilst they cause distress. Free movement is desired for the elbow after excision, and not ankylosis, as in the knee.

The dressing next day had better be carried out under chloroform, when the stuffing is washed out by an irrigator, a drainage tube introduced, and the parts thoroughly cleaned.

No more lint need be stuffed into the cavity, but the walls should be evenly compressed. The second dressing need not be disturbed for many days if all go on well; and the child may soon get about with the arm in a sling. Electricity is not of importance in the after-treatment; strength will return to the muscles in due course.

Appreciation.—Excision of the elbow for chronic disease is a satisfactory operation. In one case where I obtained a most perfect result, the neighbourhood of the joint was so enlarged, infiltrated, and undermined, that it looked as if amputation were the only measure which could afford permanent relief. For some weeks after the operation it gave little promise. But with the aid of quinine and iron, and a liberal diet, and, which was of the utmost importance, a visit to Rhyl, absolute convalescence was obtained. Every chance should be given to the arm after excision, and amputation resorted to only when no hope of saving the limb remains.

As the muscles gain strength and activity, and as the new fibrous bands connecting the ends of the bone undergo shortening and consolidation, the sail-like appearance passes off.

THE WRIST.

The bones of the wrist joint are the radius above, and the scaphoid, semilunar, and triquetrum below;

the last-named bone being separated from the head of the ulna by the triangular fibro-cartilage.

Synovitis of the wrist joint may follow a sprain or other injury. The wrist is hot and swollen, and every movement causes pain. The bulging of the synovial membrane will be made out all around the articulation, the position of the bony landmarks and the course of the tendons being obscured. This universal enlargement affords ample evidence of the joint being diseased.

Treatment.—A couple of leeches may be applied; the fore-arm, wrist, hand, and fingers enclosed in moulded splints, and the swollen part submitted to even compression.

If the disease lingers, as it is apt to do in an unhealthy subject, suppuration may supervene, but the presence of abscess need not imply a permanent stiffness.

Secondarily the other carpal bones may be implicated, and abscess having been opened about the back or sides of the wrist, the probe may touch bare and carious bone. Probably the disease begins more often in the synovial membrane than in the bones. With prolonged treatment the disease may come to a tardy conclusion with no worse result than a stiffened wrist.

In these cases of chronic bone disease of and about the carpus no gouging or other piecemeal treatment should hastily be adopted. With perfect rest of the part between moulded splints for a few or for many months a satisfactory result may be obtained.

If one begin to gouge away soft or carious bone there may be no end to that proceeding, and the very interference may increase the trouble. Nevertheless, scraping may be resorted to as a tentative measure and with the hope of weeding off suppuration. Excision of the wrist is very rarely required. Nor is amputation often necessary for chronic disease

of the bones or joints of the hand in children. In the surgery of the upper extremity conservative principles may be adopted with unusually good promise of success, but, to secure it, time, and attention to matters of detail and of general hygiene are needed.

Ganglion.—The cysts are small and uncomplicated. They are usually extremely hard, so as to offer the suggestion of their being solid outgrowth from the bone. They are generally more or less rounded, often flat, and are generally at the back of the wrist.

By firm pressure they may sometimes be burst, but, as a rule, they are best dealt with by the introduction of a stiff, grooved needle. After their evacuation in this manner, they should be firmly compressed by the thumb each day for a while, so as to prevent reaccumulation.

Club hand, like club foot, is usually a congenital deformity, in which tendons, bones, and other tissues may be concerned. There are many varieties of it, the hand and fingers being inclined either backwards, forwards, or laterally; sometimes the position taken is a complication of two varieties. The bones of the fore-arm may be greatly at fault, and often the condition is associated with other and more important bodily deformities. Nothing is certainly known as regards its causation.

If the deformity be slight, it may be corrected by manipulations, frictions, and careful splintings; if more serious, substantial division of fascial bands, tendons, or even of bone may be required. But if the malformation be extreme, and the member useless, the propriety of amputation might require consideration.

In a case of **acquired club hand** lately under treatment, the hand was strangely adducted, the deformity being due to an injury to the lower epiphysis of the ulna, some years previously, by a chaff-cutting machine. This injury had arrested the growth of the

ulna. The normal growth of the radius being unchecked, whilst the ulna remained undeveloped, the radius was strongly curved inwards. The hand was extremely useful, and on consultation it was decided that operation could offer but little improvement. (See page 384.)

Annular constrictions

may be found in the limbs, extending like a deep and narrow dimple almost to the bone; very probably they are associated with simple error of development rather than with the contraction of circular bands, the result of intra-uterine inflammatory deposits. If the dimple were deep and narrow, the opposed surfaces might be denuded by careful dissection, and the edges adjusted by suture, the linear wound dressed with salicylic wool, and the limb secured between mill-board splints.

Webbed fingers.—This deformity results from the imperfect notching of the distal extremity of the upper or bud which, in the early weeks of foetal life, represents the arm.

Several digits may be thus fused along their lateral borders, and the condition may be symmetrical on the two sides of the body. The uniting medium is composed of skin and subcutaneous tissue, with ordinary vascular and nervous supplies. Often the deformity is associated with an imperfect development in other parts of the body, and not infrequently with defective cerebro-spinal evolution.

Treatment should be undertaken in early childhood, but only when the web is unassociated with serious physical or intellectual deficiency.

Simply to divide the band in its entire length does



FIG. 81.—Annular Constriction, Compound.

not suffice, for, careful as the surgeon may be in the subsequent dressing, and widely as the fingers may be kept apart during the progress of granulation, reversion is sure to occur through a greater or less extent of the adjoining raw surfaces. One method of procedure is, therefore, to obtain a sound cicatrix at the root of the digital cleft, by causing a wire, or a piece of slender indiarubber tubing, to be worn for weeks or months through a wound which penetrates the web. The ends of the wire or tube are brought up along the back and palm of the hand and attached to a wrist-band or bracelet. When the sides of the perforation are sound the hand is severed.

An ingenious plan of operating has been described by Mr. A. T. Norton,* and it promises a good result. A triangular flap of skin and subcutaneous tissue, of about half the size of the finger nail, is dissected up at the front and back of the proper situation of the cleft, the base of the flaps being at the level of the heads of the metacarpal bones. This being done, the cleft is divided, and the raw surfaces of the flaps adjusted to each other by fine sutures; primary union taking place between these flaps, adhesion of the contiguous borders of the fingers can be effectually prevented. The dressings should be of an antiseptic nature, and for a few days the hand should be fixed on a splint and worn in a sling.

CHAPTER XXXIII

DISEASE OF THE ANKLE JOINT.

COMPARED with the hip and knee, the ankle joint is rarely the seat of disease. It is quite as much exposed to the influences of wet and cold as is the knee joint, but its mechanism probably renders it less liable to the

* *Brit. Med. Journ.*, p. 220, 1881.

effects of violence. The commonest cause of disease is perhaps a severe sprain, such an injury as later on in life might expend its violence in rupture of the internal lateral ligament and fracture of the tibia. But on account of the springiness in the child's bones, Pott's fracture is of infrequent occurrence.

Sprains.—If a child be running along, and his foot slips from an uneven surface, so that the weight which should be transmitted straight through the horizontal surface of his astragalus falls with unequal violence upon a lateral ligament of the ankle, a violent stretching results. In this stretching the synovial membrane also participates, and a considerable amount, if not of blood, at least of altered synovia, is quickly poured into the interior of the joint. This effusion of synovia is not a product of inflammation, for it is found immediately after the injury, appearing even before the ecchymosis. Probably through the influence of the vaso-motor nerves, it is but an exaggeration of the ordinary physiological secretion of the membrane, though in a deteriorated form.

The **treatment** of a sprained ankle should be energetic and complete, lest on the apparent subsidence of all active symptoms, chronic inflammation or persistent weakness remain. The child should at once be put to bed, and kept there for as long as necessary. To let him lie upon the sofa is not satisfactory, unless he be at the same time under constant supervision; he must on no account put his foot to the ground. The foot and ankle should be compressed by a soft and well-applied roller, the turns which encircle the damaged joint being drawn firmly, but not uncomfortably tight. A flexible and well-padded iron splint should be bent and fixed along the front of the leg and dorsum of the foot, and the limb should be raised on a pillow. Relief will be certain and acceptable; the

pressure and rest not only preventing the effusion of more fluid, but hurrying on the absorption of that already poured out. Possibly in a few hours the bandage will be found to require readjustment. Fomentation or lotion will not be wanted, unless the former be used with the idea of tightening up still further the even compression. Probably this is the way in which a "wet bandage" really exerts its beneficial influence.

When the effusion has disappeared, and the movements of the joint have become painless, the child may be allowed to use the foot; but even then, and for some time after, the part should be enclosed in a gypsum bandage or leather splint.

The more delicate the child the more need for all this care and precaution; but even for the most robust these measures should be duly regarded. How constantly does one find the answer to the question, "How do you account for it?" is, "He sprained his joint some time ago, but we did not take much notice of it."

If the child be amenable, and take an intelligent interest in his own case, he may go about with crutches, the sound foot being raised sufficiently by a patten or thick sole, so that in progression the diseased ankle receives no pressure or friction (Fig. 78).

Scott's dressing is a favourite application for chronic ankle arthritis; its beneficial influence is probably exerted through the pressure and rest which its employment ensures. Infiltrated synovial membrane is hardly likely to be specifically influenced by the application of blue ointment to the neighbouring skin, even with the additional help of the canthar.

Synovitis having supervened, the skin becomes hot and blushing, the joint is slightly extended, and incapable of painless movement. The capsule is full and bulging, and as the child walks he puffs himself

along with the tip of his toe. Pain may increase to such an extent that the ankle feels ready to burst.

Differential diagnosis is required to determine if the disease be in the joint itself or in some synovial bursa, or other extra-articular structure, the joint itself being free. In each case there would be joint, ineptitude to motion, and swelling; but when the articulation is implicated, the swelling is characteristic. The synovial membrane bulges out in every direction, though the fulcrum will be chiefly noticeable amongst the tendons at the front of the joint, around the malleoli, and at the back. This posterior bulging may be generally found on each side of the tendon of Achilles, so that the tendon, instead of standing as a prominent cord down to the heel, lies in the depths of a soft mass, which swells up on each side of it. Extra-articular abscess could not give rise to such universal fulness. Other morbid conditions, from which the ankle disease has to be diagnosed, are inflammation of the astragalo-scapoid joint, and caries of the astragalus, or calcis, or scaphoid bone. In the first case, the universal swelling about the tibi-tarsal junction would be absent, and the tendons just above the front of the ankle joint would not be obscured by effusion, and probably the movements of that joint will be but little, if at all, interfered with (page 497.)

With the astragalo-scapoid disease the chief part of the redness and swelling will be over the front of the head of the astragalus, rather than at the line of the larger joint. If the disease be confined to the os calcis, the skin about the heel will be red, whilst the movements of the ankle joint will be found free. It is occasionally difficult to say for certain exactly where the disease is located. This fact makes one cautious in the proposal of interference. When an inflammation has been lurking long about the astragalus or one of the lesser of synovial membranes connected with it, the

moebid process may eventually spread to and involve the ankle joint. In hardly any case will it be necessary to use a probe in making a diagnosis. All the information that this instrument can afford the eye should be able to appreciate.

The **treatment** of acute synovitis of the ankle will consist in complete rest for the limb, the application of leeches, the adjustment of a rectangular splint, and as much even compression as the angry tissue will bear. The leg and foot should be swung or raised upon a pillow. A little castor oil may be required, and an occasional dose of opium.

If **abscess of the ankle joint** attend the inflammatory trouble, the constitutional disturbance will increase, the diseased joint becoming more hot and swelled, and intolerant of the least disturbance. An incision should be made into the most prominent part of the swelling; this will probably be out of the way of either of the tibial arteries. The joint should be washed out with an antiseptic fluid, packed around with absorbent dressings, and permanently stretched on a rectangular splint.

The discharge must be kept sweet and free, the ankle being still upon the splint. The aspirator will be of no practical avail, though if an anæsthetic be administered, there is no reason against its employment.

Inflammation may be chronic from the beginning, the joint becoming enlarged on account of the swollen synovial membrane. The skin is marbled, and the muscles of the leg and thigh wasted. The disease may run its destructive course without the formation of abscess, even though the ligaments have melted away and the cartilages undergo extensive ulceration.

Much time will elapse before the joint is fit for work; it may be a question of months, or possibly even of years. But neither surgeon nor parent must

be discouraged; care must be taken that the foot is never put to the ground, and that the child does not stand up in bed.

A gypsum casting, or leather splints, moulded from the roots of the toes well up the leg, may be adjusted, sutures being arranged to allow of the escape of discharge. With this protection the child may be carried about the house or taken into the open air. If he can be trusted with crutches, his leg may be fixed as for knee disease (Fig. 79), and he may then daily attend school if special and appropriate arrangements can be made with the teacher. The foot must be kept at a right angle.

Too often it happens that, in spite of all treatment, the joint goes on from bad to worse. The ankle becomes more swollen, the amount of discharge increases, and the child's health begins to suffer. There are then three courses open: *excision, amputation, and resection.*

By **incision**, free openings are made into the joint through *secco* clarea, which is perhaps partly blocked by unhealthy granulation tissue. This measure also comprises scraping unhealthy tissue, and gouging diseased bone, swabbing out the joint with a stimulating antiseptic fluid, providing for free drainage, and then including the joint within the firm compression of antiseptic dressings, and the fixation of the foot at a right angle. If the clarea leading into the joint do not readily serve for the introduction of the spoon, incisions may be made at the side of each malleolus, through which the solid and unhealthy granulation tissue may be scraped out. This is a much less serious operation than that next to be described, from which it differs wholly in degree. Volkman* criticises the results thus obtained as "splendid," and concludes: "I have, therefore, never been under the necessity of excising the ankle joint of younger children on account

* *German Clinical Lectures*, 5th. Ser., p. 135, 1878.

of chronic cases, just as I have likewise never performed partial amputations of the foot on account of this disease."

My own experience of the operation is fairly favourable. Also, when discussing the question of the expediency of excision of the ankle joint for chronic disease, Velkouski says: "In children we gain our object, almost without exception, by adhering to conservative treatment."

If when proposing operative measures for a chronic disease of the ankle, one could be certain that disease did not extend beyond the tibiocalcaneal articulation, excision might well be urged in preference to amputation, but, as a rule, the chronic inflammatory changes have advanced beyond this, and it becomes impossible to say how much of the tarsus is affected. It is doubtful if excision of the ankle for chronic disease in childhood will ever become a favourite operation. The line of treatment should entail absolute rest of the joint, compression, the early opening of abscess, with thorough drainage and attention to such matters as those sketched out in earlier pages. If the case be not progressing favourably, no active surgical interference should at once be proposed, but examination should be made under chloroform, and, if necessary, the joint further drained. The child should be watched, the urine examined for albumen, and nothing decided undertaken unless the health be found seriously affected, and then most likely Syme's amputation adopted. It cannot be too strenuously advocated that conservative principles guide one in dealing with chronic ankle disease. Even when the joint appears completely wrecked, improvement may suddenly and almost unexpectedly set in, and recovery take place, and not seldom with a partially movable joint. From the beginning to the end of the treatment the child must not be allowed to bear any weight on the foot;

drainage should not be abused; tubes must not be of too large a caliber, and they must not be left in for too long a time. A full-sized tube run through a joint may be a source of needless irritation.

Excision of the ankle joint, as a clinical operation can rarely be needed. Incision, with scraping, will probably answer as well as the more formidable operation of resection of the ends of the tibia and fibula, and the partial removal of the astragalus. In cases where incision and the full adoption of the expectant treatment prove futile, probably no measure short of amputation will avail.

No examination of statistics as regards the result of excision of the joint in childhood, should influence me in estimating the value of the operation. Yet, to say the least, the surgeon who is preparing statistics can hardly fail to be influenced in one way or another in the selection of his cases.

Excision would be performed by a longitudinal incision over each malleolus; in this way the peroneal and tibial tendons escape injury. The first incision is made down to the tip of the outer malleolus. Then the knife is laid aside and the periosteum raspatory used; the fibula is cleared and divided, and the malleolus extracted. So also with the inner malleolus. The surface of the astragalus would be gouged, or treated with the fine-bladed saw which was used in dividing the long bones. Washings, drainage, and sutures are arranged, and the foot is surrounded in packing of wool-wool, and secured on a rectangular splint, the heel being kept from pressure.

Syme's amputation may be required for neglected joint disease in unhealthy, ill-fed children; but it is rarely needed in the well-to-do classes of society, for there the patient is likely to have been under the influence of close surgical attention from the commencement of the trouble, and the surroundings are

calculated to promote recovery. Immediately the mass of diseased tissue is removed, the child begins to mend. Anxious, sleepless, and exhausted as he was before the operation, he is henceforth at rest and happy. The pinacles of the temperature chart sink into slight elevations from the normal line, and even on the following day the child may be found amusing himself with toys or pictures.

Eradication could not, of course, have afforded such results. There would be the continued discharge from weak and unhealthy tissues, the painful dressings, and the protracted convalescence.

The operation. — Chloroform having been administered, the spirit should be removed and the leg and foot cleansed. The limb having been raised to empty it of blood, the circulation may be controlled by an elastic band round the thigh. Then the tip of the external malleolus is noted, and a spot upon the inner side of the ankle, which exactly corresponds with it. This is somewhat below and behind the tip of the internal malleolus. These two points mark the extremities of an incision which is made around the plantar aspect of the heel, and which divides all the structures down to the bone. The best knife for the purpose is a short-bladed scalpel. The incision should slope a little backwards towards the point of the heel, or else, when the os calcis has been excised, the cup-shaped flap will be found unnecessarily large and deep.

A second incision straight across the front of the ankle connects these same points; it should not be made with the idea of shaping out a flap.

Then the foot is firmly depressed, and the knife made to traverse the ankle joint, which is opened by dividing the anterior and lateral ligaments. Carefully the knife is to clear the loose tissue from along the upper aspect of the os calcis behind the astragalus, then round the posterior part of the os calcis,

through the insertion of the tendon of Achilles, and all around the sides and base of the bone within the limits of the incision; but whilst encircling the heel bone, the skin may be wounded unless the point of the knife is watchfully kept close against the bone.

The articular surface of the tibia is cleared and mown off if diseased, otherwise it will suffice to remove the malleoli with a strong scalpel or cutting pliers. The cut ends of the tibial arteries (or the two plantars) are to be looked for and secured, and any long-cut tendons pulled down and shortened with the scissors. Then the elastic tourniquet may be gradually slackened, and bleeding points seized with torsion-pressure forceps. Richardson-Cross leaves the malleoli unless they are seriously diseased.

When all bleeding has ceased, a small drainage tube, or a slip of indiarubber tissue rolled up like a quill, may be laid across the wound, and the flap adjusted by sutures. Lateral washings with sublimate solution may be used, and the wound packed around with iodoform wool, or some similar material; the limb being secured on a back splint and raised. Next day the wound may be dressed and the drainage discontinued; after this, the less the stump is wedged with the better.

The **fallacies** in the operation are in not making the inner end of the incision on the exact level with a spot immediately below the tip of the external malleolus; in attempting to shape a dorsal flap, and so getting the second incision in advance of the tibio-tarsal joint, and in opening the astragalo-scapoid joint. (By forcibly depressing the foot, and feeling the flexure of the ankle joint, this error is not likely to be committed.) In bringing the first incision so far forward in the sole, that the cup of the heel flap is awkwardly large. If the incision be sloped too much towards the point of the heel, the flap would be

too small, and the weight of the body, when the stump has healed, would be received by a surface of skin less suited for the purpose than is the ordinary heel tissue. In scoring the flap when encircling the os calcis: this accident is less likely to happen if the flap be dissected from above instead of from below, and if the blade be short, and kept well in view. The left index finger applied to the skin behind will give information of the thickness of the integuments between it and the knife. In sloughing of the flap: this is not likely to happen if the flap be not cut too long, nor too thinly raised from the bone, nor pulled and twisted during the operation.

Appreciation of Syme's amputation.—It is as ingenious in design as excellent in practice; our hardly remembers ever having seen it turn out even partially unsuccessful. Though the integuments may be discoloured, thickened with oedema, and riddled with cloaca, its performance need not be precluded. Even in the most unsatisfying case it should be preferred to amputation in the lower third of the leg. The stump is excellent for supporting weight. It is not liable to excoriation, and the cicatrix is raised out of the way of pressure.

CHAPTER XXXIV.

DEFORMITIES OF THE FOOT.

Supernumerary toes, like supernumerary fingers, may be traced to hereditary transmission. The matter is of slight importance, the foot being hidden from view, so that unless the additional toe be in the way it may be left uninterfered with. If there happen to be several superfluous toes, trussing may be

advisable. In the case of a toe being attacked by simple fibrous tissue and skin, the connection may be severed. **Webbed toes** should be left alone.

Arrest of development, or congenital hypertrophy, may affect the whole, or part of one, or both feet; the surgeon can do nothing to improve the condition. If hypertrophy appear during infancy or childhood, it will probably be the result of obstruction to the lymphatic or venous return, in which case, much may be done by raising the limb and surrounding it with fern and even compression. No speculative operation should be undertaken, but if the hypertrophy prove unamenable to prolonged treatment by pressure and position, relief may be sought in amputation. But, "although a child's gait is awkward with a naturally heavy and cumbersome limb, it is, after all, as good as with a wooden leg." (See page 151.)

Club foot may be congenital or acquired; of the former variety, the commonest is that in which the sole is inverted and the heel raised, *talipes equinovarus*. It is a combination of two defects, neither of which by itself is often met with at birth.

It is an interesting speculation as to what may be the cause of the frequent occurrence of equinovarus: in utero the feet are in position of inversion and extension just before birth. This seems to be enforced by the muscular walls of the uterus, in order that the space occupied by the foetus may be reduced to the smallest limit.

At and soon after birth a slight amount of talipes varus is generally recognizable, though it does not require surgical treatment. It may be that in the first few weeks of infancy this natural twist of the foot is effaced by a gradual development. If from tightness of the intra-uterine packing, or from the special compression of the uterine walls, the twist of the foot be rendered extreme, the development of

cradle life might fail to procure its effectiveness. Unless the deformity be dealt with surgically the foot and leg will remain undeveloped, from want of proper exercise, the os calcis being particularly small. The inner border of the foot will be drawn more upwards, and the weight of the body in progression will fall on the cuboid bone, the base of the fifth metatarsal, and the external malleolus. In these situations the skin will become hard and cornified, and bursæ will be developed between the skin and the subjacent osseous projections. Occasionally there is a considerable amount of rotation of the tibia upon its vertical axis, either outwards or inwards, more frequently the latter. If heavy boots or castings be applied to the foot and ankle, outward rotation is likely to be produced.

In an interesting paper on the etiology of club foot, by Parker and Shattock, the following conclusions are adited : *

That a mechanical theory is the most satisfactory for the majority of cases. The histological integrity of the nerve centres and of the parts concerned, as demonstrated *post mortem* in some cases which have died from accidental causes, and the possibility of completely restoring the normal function and position of the deformed limb, are facts opposed to a nerve origin, or a developmental error in the limb.

That calcaneus is probably an exaggeration by environment of the position natural to the foot during the latter period of intra-uterine life.

That varus results from similar causes, but these commence to act at a much earlier period of intra-uterine existence, the great alterations in form of the bones which usually co-exist, and the adhesions at times met with in the ankle joint, pointing to this. The causes commence to act upon the feet whilst they are in the normal position of inversion, and

* *Transactions of the Pathological Society* ; 1884.

before the capacity for muscular movement is the factor is established; continuing to act, they maintain this position, and prevent the limb from assuming those positions which are associated with proper development; the later position being, as before noticed, that of flexion (*talipes calcaneus*), the earlier that of inversion (*talipes varus*).

The **treatment** varies with the degree of deformity. A slight amount of inversion is to be expected just after birth; this may entirely disappear of itself, though most children and young adults tread more upon the outer border of the foot than the inner. A greater degree of inversion might not get well by itself, though it will yield to frictions and manipulations carried out by an intelligent nurse. Three or four times a day the foot and the muscles of the leg should be rubbed and kneaded, the heel drawn down, and the foot methodically untwisted. If after a few weeks of this treatment the condition do not appear to improve, though the employment of a slight amount of force suffices to place the foot in the desired position, it may be evenly enclosed in a dometic roller, or a soft, closely fitting sock, and surrounded with a plaster of Paris bandage, being held in the straight position until the plaster has firmly set. It may then be left uninterfered with for several weeks, at the end of which time, the twist having disappeared, the parts may be treated by massage and exercise, or the foot may be readjusted with fresh gypsum. Probably several castings will be required before the foot can be entirely freed of restraint.

In this way a considerable amount of inversion and extension may be successfully dealt with. The younger the infant thus to be treated the better.

After the foot has been for about half-an-hour in the strained position caused by the plaster, discomfort seems to have worn off. It is not so, however,

when a child is being treated with a Scarpa's shoe; in that case the improvement is obtained chiefly through the localized pressure of narrow straps, a pressure which creates a constant irritation, and which, causing a chafe or sore, demands a veritable discontinuance of treatment. With the gypsum bandage the pressure is evenly distributed over the foot in the corrected position, and with due care no sore should occur.

When the gypsum splint is applied the toe of the sock should be cut off, or the soft roller so arranged that the mother or nurse may be able to watch the colour and general appearance of the digits. If they become dusky, or be constantly cold, the casing must be at once removed, and the child brought for inspection, and probably for further adjustment. Rarely does the bandage demand removal.

The bandages are made of crinoline mesh torn into strips about two inches wide and two yards long, freed from size by boiling, and rubbed on each side with fresh, dry gypsum. They should be loosely rolled; if kept in a dry place they will be found good and serviceable at the end of many months. When wanted for use they should be dipped into a tea-cup which has been half filled with warm water in which a little salt has been dissolved. They are not to be soaked. They must be applied quickly over the sock, from the toes upwards, and just as they are beginning to get stiff the foot should be twisted into and held in the desired position; the casing becomes as hard as a brick.

The plaster of Paris method enables one to treat the club foot of a tender infant with security and success, and without the expense of a mechanical apparatus requiring daily attention.

Thus children may be dealt with in the out-patient department of a hospital, or in the outlying districts

of a country practice, with as much convenience and certainty as if they were inmates of a hospital.

Tenotomy.—If after *seven* weeks of the simple plaster of Paris treatment the position of the foot, though improved, be not entirely corrected; if there remain considerable inversion of the sole and some drawing up of the imperfectly-developed os calcis, a tendon must be divided.

Hitherto it has been much the custom to advise that the inversion of the foot should be dealt with by the division of the tendons of the tibial muscles first, the elevation of the heel being attended to at a subsequent period. The reason of this separation of the treatment into two regular steps was that the heel might be left as a fixed point from which the transverse-working of the mechanical shoe might be effected. Then when the fixation of the heel was no longer needed, the tendon of Achilles was divided and the gradual flexion of the foot proceeded with.

With the use of the gypsum rollers this practice gives place to the simpler one of dividing the tendon of Achilles to start with, and then, with the employment of some force, of bringing the foot at once into position.

This large tendon is often the head and front of the offending, and having contracted to the utmost in drawing up the heel, it has obtained a still further shortening by twisting the os calcis inwards on its antero-posterior axis. Thus its division reduces, if it do not efface, each element of the deformity.

Several times it has happened, when speculating as to which tendons would require division, to find all inversion disappear on section of the large heel tendon.

Operation.—For division of the heel tendon simply it is not necessary that an anæsthetic be administered; the tissues implicated are not highly sensitive. But if there be a shortness of assistance,

or if the child be frightened, or strong, or the position of the tendon not perfectly accessible, chloroform may be given.

The region of the proposed operation having been washed the child should be laid prone; the nurse will steady the body and arms, and an assistant will take firm hold of the one leg and guard the other from interfering with the operation; this last point deserves attention. Then the surgeon flexes the foot and seeks out the most slender part of the tendon; this is at some slight distance above the insertion into the os calcis. (See Fig. 82.)

Two knives are required, one with a sharp point for clearing the way beneath the tendon, the other with a blunt, rounded end for dividing it. The second knife is laid close at hand, and its blade is introduced immediately on the withdrawal of the first; it is, like the first, introduced upon the flat, and close beneath the tendon. The point being rounded, there is little likelihood of the skin being implicated after the section of the tendon, but to render this contingency still less likely, the tip of the left index finger should be kept on guard over the skin at the line of section.

It is better not to introduce the knife between the skin and the tendon, lest, after the section, the edge should suddenly come against the posterior tibial artery. When there is much deformity the tendon is likely to be placed close behind the course of the artery.

If the child be small the foot may be flexed with the left hand whilst tenotomy is performed with the right, the strain on the heel tendon being diminished as the knife passes through, so that the edge does not complete the section with a jump, and wound the skin. If an assistant hold the foot, he should clearly understand that he should ease the flexion before the section is completely effected.

Having ascertained that all the fibres of the tendon are divided, a small pad of dry lint is strapped over the puncture in the skin and secured with a few turns of a soft roller. No attempt need be made to correct the position of the foot for two or three days, by which time the puncture will be usually healed. Just after the amputation, however, the surgeon may see what amount of improvement is rendered possible, by twisting the foot into the proper position.

There are two reasons for not at once fixing the foot in the improved position, one being the fear of air entering the wound, and suppuration occurring; the other being lest the ends should thus be so widely separated that a firm fibrous splice fail to connect them. Such complications must be, however, extremely rare.

Contingencies.—Though one has seen the skin above the heel much injured with the knife, and even torn through, the dexterous concealment of the wound under dry lint has secured a rapid healing.

If the section of the Achilles tendon be made from the deep aspect of the tendon backwards and towards the skin, there is little chance of bleeding. In dividing the posterior tibial tendon, however, there is a considerable chance of the artery being wounded. Probably the accident has happened more often than it has been recognized. In the event of its occurrence a thick pad of dry lint should be firmly secured over the wound, the foot being also bandaged from the toes upwards. Digital pressure might be employed if necessary, and no attempt should be made at fixing the foot for about a week. The foot should be kept warm and quiet. At the time of the accident no heroic measure need be contemplated.

As regards the failure of union between the cut ends of the tendon (a contingency of the rarest occurrence) the surfaces may be vivified and apposed

in the extended position of the foot by the use of a few catgut sutures, the wound being treated with antiseptic precautions. When the union is secure the heel may be brought gradually down either with or without a fresh tenotomy. (See page 494.)

Intractable inversion of the foot may ultimately demand a section of the tendons of the *tibialis posterior* and the *flexor longus digitorum*, or possibly of that of the *tibialis anterior*, the spots at which their division should be effected being indicated in the



Fig. 62.—Tendons of the leg. The dots indicate where tenotomy may successfully be performed.

adjoining figure, copied from Brodhurst's work on orthopaedic surgery.

There may be a difficulty in a chubby child in finding the tendon of the posterior tibial muscle: it is at a spot midway between the anterior and posterior borders of the leg, a little above the malleolus. The point of the knife first finds the tibial shaft, and then, passing on the flat behind the bone, and in front of the tendon, has its edge turned towards the tendon, which it divides together with the tendon of the long flexor of the toes. If any salient band be detected at the time of operation it should be divided. So, also, with any tarsal ligaments which may be felt to keep the foot from being placed and retained in the improved position.

The anterior part of the internal lateral ligament of the ankle may require substantial section, as may

also other bands of fibres around the head of the astragalus.

In a letter to the *Medical Times** Parker recommends the division of all tight bands along the inner side of the foot, even to those passing between the internal cuneiform and first metatarsal bone. Particularly is the astragalo-scapoid capsule likely to be found at fault, and in attacking this the tendons of the tibial muscles might be conveniently divided.

The old treatment of club foot consisted chiefly in tenotomy and in the stretching of obstinate ligaments and fasciæ; the modern one demands section not only of tendons, but of ligaments, fasciæ, and all tight bands; forcible rectification, and subsequent manipulations and frictions. Parker remarks that tenotomy leaves untouched the major part of the anatomical deformity, and that the shortened ligaments reassert themselves as soon as the orthopedic instruments are left off. †

From a paper ‡ on the gypsum-treatment, by Willard, the following extracts are made: "An assistant steadies the leg at the knee, while the operator's palm presses flatly upon the patient's sole, so that by its adhesion it shall exert nearly all of the straightening power in overcoming the equinus and varus. The hooked fingers should make slight pressure opposite the shaft of the first metatarsal bone, but never upon its head, and all indentation of the casing upon the dorsum of the foot should be avoided. By this means the greatest strain will be brought to bear upon the tough skin beneath the base of the fifth metatarsal bone. The day after the operation the splint may be split up and resupplied. Frequent stretching, massage, and frictions, will be subsequently required. Intelligent and persistent manipulation is one of the most important features of

* February 20th, 1883.

† *Medical Times*, March 23rd, 1883.

‡ *Trans. Med. Society of Pennsylvania*, 1884; page 381.

the treatment. "If surgeons would but remember that the oldest and best club foot straightener is that which has been in use since the time of Hippocrates, viz. the hand, there would be fewer cases of relapse after operation."

Great good may be effected in certain cases by the use of a well-fitting Scarpa's shoe, but the supervision of the treatment must not be given over into the hands of parents or nurses. Constant inspection is needed lest the skin become excoriated, ulcerated, or gangrenous. The foot should daily be taken out, and submitted to frictions and manipulations.

Willard suggests that the danger of relapse after division is probably greater in England than in America, since the habit of the majority of English surgeons is to refrain from stretching the foot until after the union of the tendon, while in America immediate rectification is the rule. He divides subcutaneously all contracted tissues, even to tarsal ligaments, and uses great force in the "refinement." He looks upon gypsum as "the great protector of the orthopedic surgeon against the inefficiency, ignorance, and carelessness of parents in all grades of club foot."

Partial excision of the tarsus is a method which in recent years has been specially practised by Richard Dary in the treatment of inveterate club foot, but it can be rarely justifiable in childhood. Tenotomy is not an operation for children. With the use of plaster of Paris, with or without tenotomy, the most extreme deformity of childhood can be greatly improved, even if it cannot be entirely removed. Possibly the foot may be somewhat "wooden" in after years; but it will be found highly serviceable, its development being but little interfered with.

After the deformity of the foot has been corrected the child should not be allowed to put on the foot or shoe which he wore before the treatment was begun.

The subject of ***talipes equinus*** scarcely requires separate consideration after what has been already said of it in its association with inversion of the foot.

In certain cases of **lameness without apparent cause** the error may be due to slight *talipes equinus*.

When one is told that a child limps without evident reason, he should be stripped and laid flat on his back on a firm bed, and hip joint disease excluded (page 402). The knees and ankles are examined, and the equality of the limbs tested; then the points of the heels are placed together on an even surface, such as a book, and it is seen if the feet are of exactly the same length. Then one inquires if the feet are capable of the same amount of flexion upon the leg. In each case the angle at the front of the ankle should be reducible to somewhat less than 90° .

If one ankle yield less than the posital amount, the probability is that there is contraction in the calf muscles, in which case the circumference of the leg will be less than on the sound side. The amount of the difference in the development of the two legs may be nicely estimated by encircling the calves in the grasp of the fingers and thumb.

The tip of the sole of the boot will be used up before the rest shows signs of wear. If the child be made to stand upon the table, and told to bear his weight evenly upon the two feet, the knees being straight, it will be found that a sheet of paper can be passed under the imperfectly developed heel.

The limping will entirely disappear after section of the tendon of *Achilles*. To treat it by simply increasing the thickness of the heel of the boot is to obtain but specious relief, and to prevent the proper development of the heel, the foot, and the entire limb.

Congenital *talipes calcaneus* is likely to be easily corrected in infancy by systematic friction

and manipulations, carried out by the *main*. If the deformity proved obstinate, the foot might be straightened out under chloroform, and fixed in the extended position in plaster of Paris. Spontaneous division of the tendons at the front of the ankle is little likely to be called for.

Cases have been reported* in which paralytic calcaneus has been treated by excision of half or three-quarters of an inch of the elongated tendon of Achilles. The ends of the tendon were cut obliquely, so that when brought together they overlapped splice-wise (Walsham), in which position they were sutured. Much power was regained. Where the whole of the calf muscles have undergone fatty degeneration little benefit could be expected from the operation; but if there be some muscular tissue left, and response be obtained to electrical stimulation, the simple measure may be unhesitatingly adopted. The dressings would be of escharotic or caustic calamine, the foot being secured in lateral splints of plaster of Paris.

Talipes vulgaris, as a congenital defect, is rare. If the deformity cannot be cured by frictions and manipulations, nor by the methodical employment of plaster of Paris, it might be necessary to divide the peroneal tendons. But if the treatment with plaster of Paris be begun early, it is unlikely that tenotomy would be required.

Deformity of the feet as the result of infantile paralysis is an unsatisfactory matter for treatment. The leg is cold and wasted; the foot extended or inverted, perhaps both; horny patches may be formed upon the skin, wherever unequal pressure is received; the child swings the foot in a characteristic manner. The elevation of the heel after infantile paralysis is due to an atrophic shortening of the supposed muscles rather than to a physiological

* *Brit. Med. Journal*, 1884; p. 1028 and 1147.

contraction. The child may even walk on the dorsum of the foot.

If the muscles on the front of the ankle be paralysed, so that the posterior group are unimpeded in their action upon the extension and inversion of the foot, the tendons may be dealt with as for a congenital defect, even to the extent of subcutaneous section. In this way a splice is put into the tendon, and the acquisition of the normal position becomes possible.

Case.—A girl of about nine or ten, with extreme talipes equinus of each foot, the result of infantile paralysis, had for years walked only upon the tips of her toes, but soon after the division of the tendons she walked flat and well. No indiarubber springs or strappings could have accomplished such results, even if the calloused skin could have borne their pressure. If a foot is to be comparatively useless, at least let it be as in as nearly the normal position as possible. In extreme cases Syme's amputation may be appropriate.



Fig. 31.—Splice Act, from *Proc. Roy. Soc. Med. Soc. London*.

Persistent inversion of the foot may be due to the presence of a sore about the ball of the great toe. If the sore be not cured, it is likely that the muscles on the inner side of the ankle would in time undergo so much shortening as to produce uncomplicated talipes varus.

Pes cavus, or *hollow club foot*, is a rare deformity; it is probably of congenital origin.

Case.—As the boy (from whom Fig. 84 was made) walked, the chief part of his weight was received by the ball of the great toe, where the integument was thickened, inflamed, and tender. A long walk distressed him, and caused him to be kept off his feet until local quiet was restored. The instep was highly arched, and the muscles of the sole of the foot were so thinly spread out beneath it as to suggest the idea that the deformity might be in some way associated with their paralysis; but they responded fully in



Fig. 84.—*Pes Cavus.*

electrical examination, and their substance could be made out when they were thrown into a state of contraction. The plantar fascia was stretched like a bow-string from heel to root of toes. The heel was slightly drawn up, and when

the knee was kept extended the gastrocnemius did not permit the usual amount of flexion at the ankle joint. The great toe, as constantly happens in talipes equinus, was much cocked up. But on flexing the foot to the utmost, and so slackening the extensor peroneus hallucis, the digit came down to its proper level. Then, on again extending the foot, the first phalanx was well-nigh completely dislocated on to the back of the head of the first metatarsal bone.

The **treatment** involved the substantial division of the thick band of the plantar fascia, the long extensor tendon of the great toe, and the tendon of

Achilles. The foot and ankle were enclosed in lateral splints of plaster of Paris, and placed in a greatly improved position. After about ten days the casting was taken off, and a course of massage adopted.

The result of the treatment adopted proved highly satisfactory; the boy was able to run and walk without any of his old trouble. When he was seen after some weeks of exercise, the skin beneath the head of the first metatarsal bone was no longer tender.

Ætiology.—By an ingenious theory, this deformity has been ascribed to paralysis of the interosseous muscles, which have, as part of their office, the flexion of the first phalanges and the extension of the others. Though this explanation may be available in certain cases of so-called "claw foot," it has no connection with the deformity now under question. Possibly it may be due to some cramped position of the foot in utero. In *pes cavus* the toe which is most clawed is the great one, and that possesses no interosseous muscle.

Hammer toe is a congenital deformity, in which the first phalanx is raised above the level of the dorsum of the foot, the second phalanx being bent down again, so that the first interphalangeal joint presents a salient angle upwards. In early childhood the digit may perhaps be permanently straightened out by repeated manipulations by the nurse; later on tenotomy would be required. Though the flexor tendon at first sight seems to be at fault, its shortness is but secondary to the contraction of the extensor tendon. When the latter has been divided subcutaneously the toe will come straight. Subsequent splinting or stretching will be needed to maintain the improvement.

Flat feet and weak ankles are often associated in weakly children, but sometimes they occur in children who are in every other way strong and flourishing. Most infants have the weakness in some degree, but

it is only when they begin to "find their feet" that the defect attracts attention. The ankle gives way upon the inner side, much as it does in an awkward boy who is making his first attempt at skating. The condition is not serious, but if the surgeon make too light of it the mother will be apt to go elsewhere for assistance, perhaps to a "bone-setter."

For the subject of flat foot and weak ankles occurring at puberty, *see* page 65.

Treatment.—The child must be taken off his feet. Perhaps it is a fast-born, and the mother is too anxious about its physical development, and is unconsciously overtaxing the strength of the tarsal arches and ankle joint. All this should be stopped, and the ankles must have a complete rest; also proper diet and tonics must be prescribed. The rickety child, too, with a heavy trunk, big, fatty limbs, a large head, and weak bones and ligaments, is very apt to "tread over" at his inner ankle.

To the ankle itself strength may be directly imparted by shampooing. Sea salt may be dissolved in the bath water. This water may be used warm at night, and cold or tepid in the morning. The parts should be well dried and rubbed in the direction of the return circulation, and warmly covered in warmed socks. The feet and legs should never be allowed to get cold. If they become so during the night, the child should sleep in warm socks, or a warm bottle, or a warm brick wrapped in flannel, may be tucked in at the foot of the cot. High heels are bad as are, of course, tight garters. The mother will probably ask if, for the sake of the extra support, lace boots are advisable. The slight support which they could afford would be secured at the risk of retarding the free circulation which is so necessary; whilst to advise the support would be to suggest to the mother or nurse that, with it, the recourse to the other measure is, after

all, not essential. Steady improvement may be expected.

All the structures which ordinarily support the tarsal arches are relaxed; the muscles and tendons of the leg and foot, and the plantar fascia and ligaments; so the astragalus and scaphoid sink inward, and the foot is splayed outward. There is no real association between this condition and talipes valgus.

It is in vain that the instep of the flat-footed child is surrounded with a strap, or the ankle encumbered by an iron support; such measures are often carried on with serious expense, and concluded with disappointment. Perhaps the child is altogether out of health, and requiring change of air, and other tonics; or he may be standing too much at school or work, or frequently carrying weights too heavy for him.

In the case of the flat-footed girl, one may find that there is a heavy baby or young child that she is constantly carrying about; or she may be standing through many hours at her usual work, or walking a long distance to and from it daily. The boots should be examined; possibly they have high heels and narrow toes; such heels give no fair support, and allow the foot to fall inward, and so receive unequal strain. Often this form of flat foot is associated with obscure pains along the front or back of the leg; one has known such a patient treated for "rheumatism." Flat feet may result from atrophy of the posterior tibial muscles, the effect of infantile paralysis, the legs being much wasted along the inner aspect (Fig. 83).

Treatment.—The feet must have rest, and be fairly shod; old and badly fitting boots should be discarded. Frictions and shoeponings, rubbings and kneadings, are to be methodically carried out, and the child taught to exercise the affected muscles, so as to impart to them renewed strength and vigour. She should also be shown how to cause the tibialis anterior

and positions, and the flexion of the toes, to contract until the inner border of the foot can be drawn up at will, and until at last she can, in standing, support her whole weight on the outer side of the foot. She should be made to walk along on the outer border of the foot until she is tired. This exercise should be done every morning, noon, and night; after a short time, when improvement becomes evident, the child will take interest and pleasure in it. With this desirable exercise the muscles which support the instep become greatly strengthened.

The boots should be after Thomas's pattern, with the heel and sole raised all along the inner side, as shown in the adjoining sketch. The heel and sole are made to form a continuous surface along the inner side of the shoe. The design is much more efficacious than that of attempting to raise the instep by a pad of leather or cork, or a steel spring, placed inside the boot.



Fig. 36.—Boot of
leather for Flat Foot.

Seeing how, with careful supervision and attention, children grow out of their flat-footedness, the propriety of performing any cutting operation on ligues or tendons should not be contemplated. The forcible manipulation of the foot under an anæsthetic, and the subsequent encasement of it in plaster of Paris, is hardly likely to be required, nor is the more serious operation practised with success in the adult by Ogston, of pegging together the transverse surfaces of the metatarsal and scaphoid bone.

CHAPTER XXXV.

DISEASES OF THE FOOT.

Like the vertebrae, the tarsal bones consist almost entirely of spongy tissue; they are much exposed to injury. Interspersed amongst the osseous segments, there are many folds of synovial membrane which are ready for any strain or laceration to become inflamed.

Whether tarsal disease begins more often in the bone or the synovial membrane cannot be certainly affirmed, but the trouble may quickly extend from the one tissue to the other, till the whole tarsus and metatarsus are involved. The disease may begin as a purpy synovitis or tubercular osteitis. It is usually chronic. The child complains of his foot "hurting" him, or "aching," and at first there may be no local indication of disease; but the parts soon become swollen, and the skin grows dusky. In due course an abscess forms, and is incised, or, finding its own discharge, an indolent cloaca remains, from which a thin fluid is constantly oozing. The skin opening is in time encircled with a ring of unhealthy granulations, and becomes adherent to the subjacent tissues, even to the bones. Probing such a sinus distresses the child, and as it is already abundantly certain that diseased bone is exposed in the depths, the probe affords no information of a fresh or practical value. Nor is it necessary that the surgeon enquire too closely as to which bone or joint is specially diseased. The information can be only obtained at the expense of harmful examination, and will in no way alter the treatment.

The **astragalo-scaploid** joint is, on account of its size and range of movement, specially apt to be

attacked, and, the astragalus itself being invaded, there is a great risk of the disease extending to implicate the ankle joint. Indeed, in whatever part of the tarsus the inflammation may arise, it is apt to ignore all anatomical boundaries, and spreading from joint to joint and bone to bone, to involve the whole foot. (See also page 471.)

The **treatment** should be begun at the first indication of alarm. The foot, ankle, and lower half of the leg should be enclosed in lateral leather splints or gypsum; and for a short time, if only to impress the child with the need for care, he should be kept in bed, with the foot raised on a pillow. No counter-irritation or local application of any kind, beyond the dry compression just described, will be required. If the patient can be trusted he may be allowed to go about with a high boot or patten on the sound foot, as shown in Fig. 73.

As abscess approaches the surface it may be dealt with or left to open spontaneously. A good rule with regard to the treatment of such abscesses is to incise only those in which tension of the sensory nerves is causing pain and weariness, and leave the others uninterfered with. Care must be taken that the discharge when once established is free, and for this purpose holes may be made in the casing corresponding with the nerves.

The general treatment will be upon the lines laid down on page 247, whilst "passive inactivity" should characterize the direct treatment of the diseased tissues. It is often advised that carious patches be gouged out, destroyed with sulphuric acid, or even excised, but to make use of such measures may be unnecessary and disappointing. No probe or other instrument need approach the foot, though if in the course of the disease a sequestrum be found working its way out, it may be removed by the dressing forceps.

A few years ago an unhealthy boy was under treatment for general septicæmia of such turgor accompanied with abscesses. He was kept off his feet for three years, and at the end of that time his right foot had repaired soundness. Then he was trusted on crutches, and the treatment was continued for the left foot. Three years later he was still paid occasional visits, but this foot had also recovered and he was walking well.* A completely satisfactory result attended the quiet, expectant treatment, without either probing or gouging. Had one operated it must have been impossible to have known when enough of the softened bone had been scraped out.

Caries of os calcis may remain confined to that bone. Small sequestræ may come away with molecular, watery, or purulent discharge (caries necrotica).

If under the influence of rest, drainage, and the administration of tonics and good food, the case do not progress, the infamed tissue may be improved by scraping with a Volkman spoon, by gouging, or even by the partial or complete excision of the bone. It is better to excise the entire shell of the os calcis than merely to scoop out the chief part of its softened interior.

The **operation** is thus described by Holmes:† A horizontal incision is made down to the bone, from the inner side of the tendon of Achilles, round the outer side of the heel and to the front of the calcaneo-cuboid joint; this incision divides the large tendon. From the front of this a cross cut is made deeply into the sole to about the inner border of the os calcis; this would divide the tendons of the peroneus longus and brevis. The flap having been raised by the strong retractor, the joint with the cuboid and

* *British Medical Journal*, of Dec. 8th, 1883.

† "*System of Surgery*," ed. 3d., p. 771. 1883.

then the joints with the astragalus are opened, and the bone is dug out. The foot left after the operation may be a very useful one.

If many tedious months of this expectant treatment hold out no hope of recovery, the supervision having been thorough, and the surroundings the best obtainable in the circumstances; if the boy be going backward rather than improving, the question of amputation must be considered. But, seeing what can be effected by time and rest, it is well that amputation be delayed to the utmost.

Incision and exploration under an anæsthetic should not be too readily undertaken; it is often the prelude to amputation; the multiplicity of the joints, the wanderings of synovial membranes, and the spongy condition of the bones, are a contra-indication to excision.

Neither Chopart's, Pirogoff's, or any other partial amputation is desirable. The entire tarsus must be removed, for disease will be apt to arise in any portion of it that may be left, whilst an stump can ever be so serviceable as that of a "Syme" (page 475).

Spence considered all modifications of amputation of the foot as "anything but improvements" on Syme's method.*

The **metatarsus** is often associated with the tarsus in disease; sometimes one or more of these long bones will be affected whilst the tarsus remains apparently sound.

The remarks made concerning the treatment of tarsal disease apply to disease of the fore part of the foot.

Chilblains are inflamed patches of skin produced by cold. They are met with chiefly on the feet and hands, as these parts are far removed from the centre of circulation; they may also appear upon the nose or ears. Girls suffer from them more than boys, as their

* "Lectures on Surgery," vol. ii., p. 611. 2d ed.

circulation is less vigorous, and they are not generally accustomed to keep it brisk in cold weather by exercise. Chilblains are less apt to appear in bright, frosty weather than in the thaw which follows. "They are caused by paralysis of the capillaries, with serous exudation into the tissues of the cutis."* Strumous children are very liable to chilblains, as their tissues are feeble and the circulation through them is slow and languid.

A mediocrity-physiological theory has been suggested by Cohnheim for the fact of chilblains apparently coming on when the cold weather has given way. During the cold the vaso-motor nerves were damaged, the circulation through the tissues was seriously interfered with, and thrombulation took place; with the warmer weather the circulation and the sensibility were restored and the result of the disturbance rendered evident. (It is in somewhat the same manner that water-pipes which have burst during the frost show the extent of the damage only when the thaw has well set in.)

Three stages mark the progress of a chilblain; first, the skin is a little swollen and red; it is associated with itching, which becomes intolerable when the child gets warm in bed, keeping her restless and awake. By day the warmth of the fire, or that produced by friction or exercise, will increase the irritability. The child can hardly keep from rubbing at or scratching the burning place. In the second stage serum oozes from the engorged vessels throwing up the epidermis into vesicles or blebs. The adjoining skin is dusky red or purple. In the third stage the blood-stained serum has coagled from the bleb, and the purple skin yields to ulceration or gangrene. The chilblain is then spoken of as "broken."

* "Surgical Pathology," Edinb. (New Sp. Soc.), vol. i., p. 226.

Prophylaxis.—Some delicate girls are martyrs to chilblains, from late autumn to early spring. Much care should be given to the maintenance of the general health, and for this purpose cod-liver oil, iron, and other tonics may be daily administered.

Every day, and twice a day, if expedient, the child should go out of doors for a brisk walk. She should wear strong, easy boots, and thick woested stockings; also a flannel vest up to the neck, and long in the sleeves, and flannel drawers, and she should sleep in a flannel night-dress and bed-socks. Boots and stockings should be changed after the walk, and they should always be put on dry and warm. A tight boot is harmful in that it impedes the instantaneous circulation; and a high heel crowds the toes together into the front of the boot. Thomas Smith gives a caution against the use of tight garters, and also against allowing the child to sit long in a cold room with the feet hanging down.

The hands should be covered in loose gloves, which are enclosed in woested mittens, or are lined with fur; the boots, and especially so in damp weather, may be provided with an inner sole of cork. When the hands or feet are benumbed with cold, their warmth should be restored by friction; they should not be warmed at the fire. The plan occasionally resorted to, of attempting to improve a child's languid circulation by cold baths, or by cold or barely tepid washings, is not to be resorted to; cold or chilly water depresses the circulation. The hands and feet should be washed in quite warm water, and then carefully rubbed with a warm, dry towel.

The **treatment** is extremely unsatisfactory, as *a priori* might have been imagined when one sees how long a list of remedies are recommended. Billroth throws out a string of remedies, and suggestively remarks, "These will be enough for you at the

commencement of your practice for dealing with this troublesome complaint. Sometimes one does good, sometimes another." In the first stage, frictions with the hand may do good by restoring circulation in the reddened area; and liniments may be tried. Probably it matters little as to what the ingredients of the stimulating embrocation may be; the liniment camphoræ et. is much used, either alone or in combination. Rubbing the feet with snow is a favourite and efficient means of exciting the circulation of cold hands and feet. In the later stages frictions and liniments are out of place, but Friar's balsam may be painted over the raw surfaces. The new local anæsthetic, hydrochlorate of cocaine, in solution, might be expected to afford relief to intense itching and pain.

If sloughs be loosening, a small piece of lint soaked in dilute carbolic acid lotion might be worn under a rather larger piece of oil-silk. In these circumstances amputation cannot be taken.

Chilblains upon the heel are frequently met with. They must be freed from all pressure of the boot. For this purpose the upper leather should be cut away, right down to the level of the heel of the boot, the gap being filled in by a piece of soft, black kid. The scres about the heel may give rise to much suffering. They may be dressed with the Friar's balsam, vasoline and eucalyptus, or, as remarked above, with a solution of cocaine.

Spontaneous gangrene is occasionally met with. A child was lately in the Locom ward who thus lost certain fingers and toes. The case ended in recovery. The gangrene may be the effect of a feeble circulation (as in the case of chilblains), or its nature may be closely allied to that of cancerous oris (page 183). The urine should be tested for albumen. The affected part becomes livid, and then black; the epidermis is

raised in blebs, from which ill-smelling serum issues. There is much constitutional depression, from which, or from some form of septicæmia, the child may sink.

The part should be dusted with iodoform, and wrapped in cotton-wool. There should be no rash interference in the way of cauterisation or amputation; a line of demarcation must be patiently awaited.

Perforating ulcer of the foot may be secondary to central disease of the nervous system. A case of this rare nature is reported in the *Lancet* of April 5th, 1884.

Scabies is apt to give rise to extensive irritation on the feet and hands. Sometimes the parasitic disease is associated with ulceration. The subject is dealt with in works on dermatology.

INDEX

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Quarrelers, 204
 —, *Differential diagnosis of*, 205, 206
 —, *Treatment of*, 205
Deep injury, *amputations*, 34
Orbit, *Puffiness in*, 215, 216
 —, *Pain in*, 216
Orbitals for nasal, 214
Orbit, *Foreign bodies in*, 215
Orn, *Congenital hypertrophy of*, 228
 —, *Lancing the*, 228
 —, *Name of*, 228, 229
 —, *Spontaneous*, 228
 —, *Treatment of*, 229
Ovariotomy, 48
Oxytocic bandage, *(See* *Plaster of Paris**)*

Hemorrhoids, 390, 391
Hemorrhoids, 390, 391
Hemorrhoids, 390
 —, *Treatment of*, 390
Hemorrhoids from umbilicus, 391
 —, *in infancy*, 391
 —, *in childhood*, 391
 —, *occurring from bladder*, 391, 392
 —, *from anus*, 391, 392
 —, *from nose*, 391
 —, *from rectum*, 391, 392

Hemorrhagic diathesis, 391
 —, *Treatment of*, 391
Hilly, 391, 392
Hilly, 391, 392
Hilly, 391, 392
 —, *Definition of*, 391
 —, *Diagnosis of*, 391
Hilly, 391, 392
 —, *Age for operation on*, 391, 392
 —, *operation*, 391
 —, *Congenital*, 391
 —, *Scars*, 391

Hilly, 391, 392
Hilly, 391, 392
Hilly, 391, 392
 —, *Definition of*, 391
 —, *Diagnosis of*, 391
Hilly, 391, 392
 —, *Age for operation on*, 391, 392
 —, *operation*, 391
 —, *Congenital*, 391
 —, *Scars*, 391

Hilly, 391, 392
Hilly, 391, 392
Hilly, 391, 392
 —, *Definition of*, 391
 —, *Diagnosis of*, 391
Hilly, 391, 392
 —, *Age for operation on*, 391, 392
 —, *operation*, 391
 —, *Congenital*, 391
 —, *Scars*, 391

Hilly, 391, 392
Hilly, 391, 392
Hilly, 391, 392
 —, *Definition of*, 391
 —, *Diagnosis of*, 391
Hilly, 391, 392
 —, *Age for operation on*, 391, 392
 —, *operation*, 391
 —, *Congenital*, 391
 —, *Scars*, 391

Hilly, 391, 392
Hilly, 391, 392
Hilly, 391, 392
 —, *Definition of*, 391
 —, *Diagnosis of*, 391
Hilly, 391, 392
 —, *Age for operation on*, 391, 392
 —, *operation*, 391
 —, *Congenital*, 391
 —, *Scars*, 391

Hilly, 391, 392
Hilly, 391, 392
Hilly, 391, 392
 —, *Definition of*, 391
 —, *Diagnosis of*, 391
Hilly, 391, 392
 —, *Age for operation on*, 391, 392
 —, *operation*, 391
 —, *Congenital*, 391
 —, *Scars*, 391

Hilly, 391, 392
Hilly, 391, 392
Hilly, 391, 392
 —, *Definition of*, 391
 —, *Diagnosis of*, 391
Hilly, 391, 392
 —, *Age for operation on*, 391, 392
 —, *operation*, 391
 —, *Congenital*, 391
 —, *Scars*, 391
Hilly, 391, 392
Hilly, 391, 392
Hilly, 391, 392
 —, *Definition of*, 391
 —, *Diagnosis of*, 391
Hilly, 391, 392
 —, *Age for operation on*, 391, 392
 —, *operation*, 391
 —, *Congenital*, 391
 —, *Scars*, 391

Hilly, 391, 392
Hilly, 391, 392
Hilly, 391, 392
 —, *Definition of*, 391
 —, *Diagnosis of*, 391
Hilly, 391, 392
 —, *Age for operation on*, 391, 392
 —, *operation*, 391
 —, *Congenital*, 391
 —, *Scars*, 391

Hilly, 391, 392
Hilly, 391, 392
Hilly, 391, 392
 —, *Definition of*, 391
 —, *Diagnosis of*, 391
Hilly, 391, 392
 —, *Age for operation on*, 391, 392
 —, *operation*, 391
 —, *Congenital*, 391
 —, *Scars*, 391

Hilly, 391, 392
Hilly, 391, 392
Hilly, 391, 392
 —, *Definition of*, 391
 —, *Diagnosis of*, 391
Hilly, 391, 392
 —, *Age for operation on*, 391, 392
 —, *operation*, 391
 —, *Congenital*, 391
 —, *Scars*, 391

Hilly, 391, 392
Hilly, 391, 392
Hilly, 391, 392
 —, *Definition of*, 391
 —, *Diagnosis of*, 391
Hilly, 391, 392
 —, *Age for operation on*, 391, 392
 —, *operation*, 391
 —, *Congenital*, 391
 —, *Scars*, 391

Hilly, 391, 392
Hilly, 391, 392
Hilly, 391, 392
 —, *Definition of*, 391
 —, *Diagnosis of*, 391
Hilly, 391, 392
 —, *Age for operation on*, 391, 392
 —, *operation*, 391
 —, *Congenital*, 391
 —, *Scars*, 391

Hilly, 391, 392
Hilly, 391, 392
Hilly, 391, 392
 —, *Definition of*, 391
 —, *Diagnosis of*, 391
Hilly, 391, 392
 —, *Age for operation on*, 391, 392
 —, *operation*, 391
 —, *Congenital*, 391
 —, *Scars*, 391

Hilly, 391, 392
Hilly, 391, 392
Hilly, 391, 392
 —, *Definition of*, 391
 —, *Diagnosis of*, 391
Hilly, 391, 392
 —, *Age for operation on*, 391, 392
 —, *operation*, 391
 —, *Congenital*, 391
 —, *Scars*, 391

Hilly, 391, 392
Hilly, 391, 392
Hilly, 391, 392
 —, *Definition of*, 391
 —, *Diagnosis of*, 391
Hilly, 391, 392
 —, *Age for operation on*, 391, 392
 —, *operation*, 391
 —, *Congenital*, 391
 —, *Scars*, 391

Hilly, 391, 392
Hilly, 391, 392
Hilly, 391, 392
 —, *Definition of*, 391
 —, *Diagnosis of*, 391
Hilly, 391, 392
 —, *Age for operation on*, 391, 392
 —, *operation*, 391
 —, *Congenital*, 391
 —, *Scars*, 391

- [illegible]

Whispering cough, Clouston on

— tongue in, 320

Whooping cough, Pott's remedy in, 324

(See Larynx and Trachea.)

Wound, sucking nuchal, 33

Wrist, Disease of, 466

Wry neck, 358

Wry neck, Causes of, 358

— — — from external cause, 378

— — —, Treatment of, 371

Yellow fever, 33



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